FORESTRY ABSTRACTS

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A SUMMARY OF INFORMATION ON *PTEROCARPUS ANGOLENSIS*

By

J. S. GROOME, H. M. N. LEES, and L. T. WIGG

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9. SILVICULTURAL CHARACTERS

Light. Like the 5 species of *Pterocarpus* reported on by Troup for the Indian region [55], Muninga is a light-demander. It will persist in moderate shade but generally only to stagnate and eventually die. Though the seedling is stated to require shelter, this is probably not generally true, as unshaded nursery sowings germinate and grow satisfactorily, field plants can be established in open land and natural regeneration often appears in open cultivation.

Coppicing Power. Muninga is a persistent coppicer in the seedling and establishment stages, and examples can be found of strong coppice shoots sprouting from stumps and low pollards, but it is doubtful, in spite of its sometimes extraordinary vegetative vigour, whether coppice production for timber could be relied upon. It is likely that fire is the chief agency hitherto preventing the growth of timber from these strong but sappy shoots. An example of a possible exception is illustrated by Wigg [62]. In the Southern Province of N. Rhodesia it is reported [64] that trees cut in August and October coppice more freely than those cut in any other month. No reproduction from root suckers or cut roots in the forest has yet been authenticated.

Fire. The ability of Muninga to regenerate and grow in the worst fire conditions is illustrated in a plot, clear-felled in 1933 at Ndola, N. Rhodesia, and late burned for over 20 years. A group of Muninga poles is now the only tree growth on it. Of these, the 10 single stems were 23–32 ft. high and 9–16 in. in b.h. girth in 1950. Only on the Kalahari sand of N. Rhodesia has its fire-hardiness been in question [64]. Older trees are frequently seen with the thick bark of the lower bole blackened by fire. Where ingress is eventually made, either by its own agency or through other lesions, fire will char the butt and render the tree liable to windthrow.

Drought. Muninga is outstanding also in its ability to establish itself in very dry conditions, e.g. a 20-in. rainfall in loose aeolian sand with the water table at 200 feet. In such situations it may, however, suffer in the competition for ephemeral supplies of water in the superficial layers, a point in the establishment of natural regeneration and its further development that requires clarification. No information appears to be available on the comparative resistance of Muninga to abnormal seasonal droughts. The seedling in its germination stages is likely to suffer heavy mortality if moisture supplies fail.

Frost. In the Rhodesias the range of this species extends into localities subject to frost. Low temperatures no doubt play their part in causing, or perhaps stimulating, an inherent die-back rhythm in young regeneration, as do no doubt both fire and drought. Frost does not appear to be important in injuring older growth, though periodic damage to such trees is reported in one of the subtypes of *Baikiaea plurijuga* forest in Matabeleland, i.e. where Muninga is a co-dominant with *Burkea africana* in depressions (see section 4).

Animal Damage. Save for the spectacular depredations of the elephant, there is little on record, even for areas where Muninga grows gregariously. Elephants strip off and chew the bark, and for N. Rhodesia it was estimated [38], from sample enumerations over 300 sq. miles, that 30% of the mature

trees had more than half their girth stripped and, in all, 60% received some damage in this way. In the Western Province of Tanganyika the damage reported is mainly of another sort, namely through elephants rubbing against mature stems and breaking younger ones. In this same Province the Germans reported damage to young plants by spring hares (*Pedetes* sp.) [41]. Few details are reported of insect pests, which are presumably unimportant, though leaf eating has been noted on young plants [64]. Insects do some damage to the seed, and rats are reported to eat it [64].

Fungi etc. A proportion of logs brought into mills show heart rot in the butt, and honey hunters expose similar hollows higher in the bole and branches when smoking out bees, but no information is available on the species of fungi responsible. The general impression gained from seeing many logs at stump and at mill is that the tree is fairly free of fungal attack [64]. A *Loranthus*, reported from Tanganyika and N. Rhodesia, does not appear to be important.

10. Natural Regeneration

Fruits already fallen on the ground are assisted by their spines and wings to roll and drift considerable distances in the wind. Before the rains break, any burning of the ground vegetation allows of ready contact with the soil in the unclosed ground cover that is typical of the *Brachystegia* forests. Beaten down by the rains, the fruits become anchored by their spines and the wing conserves moisture below, attracting termites to breach the hard hull. It is generally held that fire, termites and the alternation of wetting and drying in the first rains (demonstrated experimentally in N. Rhodesia) all assist in freeing the germinating seed. The brittle and fleshy young seedling is sensitive to drought, which is stated to cause heavy losses in S. Rhodesia. For recently fallen fruits to produce regeneration in the following rains, a happy combination thus appears to be necessary of early germination and sufficiently protracted rains. Fruits lying over to the next rains without germinating show a great falling off in the soundness of the seed [64]. Nursery observations show that the best and earliest germination occurs without shade. These considerations probably help to explain why regeneration is slow and sparse in the forest but frequently abundant in abandoned cultivations. In *Brachystegia* forest at Simbo, Tanganyika, where the ground is shaded, a quadrat charting of the vegetation showed the following per-acre height distribution for Muninga:

Height in feet ..	1	2	3	4	5–10	11–20	21–30	31–40
No. per acre ..	27	19	4·5	3·3	6·4	3·7	14·5	6·4

The conditions here are such that only in a few favourable stations do plants enter the sapling stage. An intense competition is predicated for light and water, competitors for the latter including not only the obvious trees, shrubs and grasses, but also an important subterranean population of woody species dying back annually to ground level, which Glover [19] has called the Cryptodrymion or "hidden thicket". Muninga remains a member of this for about 7 years (0–14 years), developing an extensive root system before the dieback of the shoot is replaced by continuous stem growth [see section 3]. It is considered probable that improvement fellings (by poisoning to eliminate regrowth and its competition) would increase the recruitment and reduce this period of establishment. Natural regeneration is reported in Nyasaland to compete with grass and to grow up through it. An example of regeneration successfully overcoming the drawback of regularly applied late burning has already been mentioned [section 9]. Free overhead light and a reduction of tree root competition are conditions of this plot. Where exceptional competition for superficial and ephemeral water supplies occurs (Kalahari sands, N. Rhodesia) the species is not so successful. In the Mvua-Livulezi forest in Nyasaland, where *Oxytenanthera* bamboo forms a dense understorey, regeneration is under observation to see whether it follows gregarious flowering and the burning of the dead culms. This, if proven, should give regeneration cycles coincident with the flowering interval, an investigation of which might provide valuable information on Muninga's rate of growth. The normal types of diameter-class distributions shown in sample plots in Tanganyika and Mozambique [2] may be further evidence of the invasive character of Muninga regeneration, showing these stands to be even-aged pioneers that have colonized open areas, e.g. abandoned cultivation.

11. Artificial Regeneration

Nursery Practice

Germination is irregular, and seedlings of one batch may continue to appear from the third week to the sixth month from sowing. To reduce this period the following pretreatments have been tested in N. Rhodesia: (*a*) alternate wetting and drying in the sun; (*b*) exposure in termitaria until the hull is breached; (*c*) exposure of piles of fruits to rain for several months; (*d*) scorching; (*e*) crushing; (*f*) clipping off part of the pod. Methods (*b*) to (*e*) are said to be wasteful, but there are

no published results of these treatments. Lees reports on an experiment in N. Rhodesia in 1955 [64] to compare the effects of 70% shade and no shade; of sand and natural soil for the seedbed; of sand and soil for covering the seed (¼ inch) and the fruit (one inch); and of sand and soil for anchoring fruit pressed on the bed surface as far as the wing. Twelve sowings combining these treatments were made at the end of August and watered every evening until continuous rain began (2nd November). There was a much higher mortality in seedlings under shade (probably due to excessive moisture), except for sowings on sand. The best germination and plant % (at 177 days) were for seed sown on and covered with sand under shade, viz. 47 and 36%, and for seed sown on earth and covered with sand without shade (47 and 34%). In these treatments first germination occurred after respectively 13 and 15 days, but under shade germination lasted 20 days longer (97 against 77 days). The best treatment for fruits was anchoring with soil on natural soil without shade, the germination and plant % being 29 and 25, but germination first occurred after 77 days and lasted 58. No buried fruits germinated under shade. The best results with buried fruits were on a seedbed with a cover of natural soil without shade, the germination and plant %s here being 21 and 14, germination first occurring after 68 days and lasting another 99 days. G. Watkins [64] has made laboratory tests of small lots of hulled seed which, untreated, showed 16% germination between the 11th and 37th day. The best result was from immersion in concentrated H_2SO_4 for 15 minutes and washing for 5, giving 60% germination between the 4th and 19th day. Soaking seed for 24 hours in water is stated to improve gemination. Rapid and regular germination is important for the planting programme, since strong plants are required as early as possible if a large part of the first growing season is not to be lost. Seed lying ungerminated, moreover, tends to deteriorate. Sowings of seed and of edge-cut fruits made in Tanganyika show the same protracted germination. Edge-cut fruits were set with the cut edge in the soil and the wing exposed, a practice not generally favoured as cotyledons or radicle or both may be trapped in the pod. The clipping of one edge of the pod [that opposite the stalk? cf. [55] under *Pterocarpus*, germination], sowing on natural soil and anchoring with soil without shade, may prove the cheapest nursery practice, but removing and pretreating the seed are likely to give better results. At the end of the first rains, shoots 1–12 in. long are reported, but in the ensuing dry season, whether they are watered or not, some seedlings die back, others shed their leaves (the shoots remaining alive) and yet others retain their leaves. The proportion dying back is stated to be about 30% in N. Rhodesia. Further growing and dormant seasons increase the irregularity of the seedbed stock. As an indication of what to expect, a sowing in December 1944 in Tanganyika of 5 lb. of seed gave a plant % of 10 (about 1000 plants) in May 1946. Of these, 167 plants having 3- to 4-ft. shoots, 2 ft. of 'carroty' roots, and a root-collar diameter of about 0·4 in., were selected for planting out. One 19-month plant from an edge-cut fruit was 7 ft. high with a root-collar of ⅞ in. It appears useless to judge the suitability of planting stock after the first dormant season by their shoot length. The size of the 'carroty' root, probably best judged from the diameter at collar, is the most important criterion.

The general conclusions to date are that seed or cut fruits should be sown just as soon as temperatures favour germination, and kept moist by watering if rain is wanting; that beds should be of natural soil, raised and unshaded; fruits should be pressed flat on the bed and anchored with earth; seed should be thinly covered with sand; and both fruits and seed should be covered with a light mulch to maintain moisture. Once the brittle, turgid, initial stage is passed, natural rainfall probably suffices, but judicious watering might prolong the period of growth. Further enquiry would be profitable on the mechanical extraction of the seed, the pretreatment of both seed and edge-cut fruits, seed-tree selection and the best form and size of field plant.

Field Sowings and Plantings

(*a*) *Direct Sowings*. Direct sowings of fruit are reported from Tanganyika and N. Rhodesia to have had little or no success even where 20 fruits were sown per spot. Direct sowings of seed are reported to be practicable in Mozambique [6]. In N. Rhodesia 40 and 80% stocking is claimed from sowings of respectively 4 and 6 seeds per spot, but sowings at the latter rate through natural woodland resulted in only 20% stocking.

(*b*) *Plants and Stumped Plants*. Field planting is reported from Mozambique, N. Rhodesia, Nyasaland and Tanganyika, most of the plant material used consisting apparently of the main taproot with or without some length of shoot. Comparisons of performance between nursery stock of different ages have too often been vitiated by the use, for the first plantings, of the largest individuals from a batch of sowings, leaving the slower growing stock for the subsequent years' plantings. Differences in the weather of these years introduce a further complication. In N. Rhodesia stumps made at 6, 18 and 30 months and set out in Kalahari sand showed a 90% take. Stumps made at 12 months showed survivals of 63 and 42% at the ends of the first and second dry seasons respectively. Stumps made

at 48 months showed 78% survival at the end of the first dry season. These had 2 inches of shoot and a 9- to 12-in. taproot. Similar stumps from 12-, 24- and 36-month stock (of the same sowings) were set out near Tabora from 1952, and the first two lots have shown strong shoot growth of the type that does not die back. At Morogoro, 176 stumps of 14-month stock from plants having 3- to 4-ft. shoots and taproots up to 2 ft. long, were set out in 1946 in cleared grassland at 15-ft. triangular spacing. In 1956, of 74 survivors, three were forked at the base with 2 stems each (up to 18 ft. high). Of the others, 15 had b.h. girths of 10–15·5 in. with total heights of 17–25 ft., 39 had girths of 7–9 in. and heights of 11–21 ft., and 17 had girths of 2–5 in. and heights of 6–13 ft. The question of the best size of stump has still to be answered. A minimum diameter at collar of 0·4 in. is suggested, but all indications point to large stumps giving better survival and growth. Little experience has yet been reported as regards spacing. In N. Rhodesia 6 × 6 ft. has been used; dieback of shoots has been noted up to 10 years in these plots. Initial success with stumps at 25 × 25 ft. in natural woodland has been reported from Nyasaland. In Mozambique, the beneficial effect of weedings in this type of planting is shown by the following comparison of two 9-year plots:

Weeded:	Mean height (ft.)	16·4	Mean diam. (in.)		5·3
Unweeded:	,, ,,	9·8	,, ,,		3·5

(*c*) *Cuttings and Setts.* The sprouting of Muninga poles in native courtyard fences is a common sight in Western Tanganyika. Sporadically since 1928 the White Fathers at Ndola, near Tabora, have used such large material for planting. Groome [23], reporting on this, states that 9½-ft. poles set 1½ ft. in the ground in 1935 had produced by 1955 a 30% stocking of trees containing one log-length each. Repeated beating up over many years was required. September to October, before the rains break, is considered the best time for this type of planting. The initial take is put as low as 5% but one count in a fence showed 2 out of 5 surviving. The use of such setts, however, means for each one taken the destruction of an established pole. At Tabora in 1929, 1939 and 1944 thousands of truncheons (thick stem cuttings) of various lengths, set to various depths at various angles in every month of the year were under test [23]; the sprouting of shoots frequently indicated success but no appreciable number ever survived. Experiments with careful control of such factors as soil moisture and temperature, pretreatment with auxins, and close observation of callus and root formation are called for with a species of such obvious vegetative vigour.

Cardoso [6] states that cuttings 1·5–3 m. long have been successfully established in Mozambique. Planting was 5 × 5 m., for thinning to 10 × 10 m. at 10 years. It is not clear whether these cuttings were first rooted in a nursery. The best time for planting is in the dormant season (June–August) and there is a marked response to weeding. Cardoso includes a table showing in metres the mean increase of a plot of such cuttings in total and bole height and in b.h. girth from the 7th year (means respectively 3·2, 1·10 and 0·08) to the 18th year (7·0, 3·0 and 0·17).

12. Rate of Growth, Form and Volume

Girth and Diameter. Most of the increment data available come from closed woodlands in which no thinnings or improvement fellings have ever been made, and Delevoy [10] considered that growth rates in such woodlands were likely to be doubled under proper tending. Attempts to determine rate of growth have been made notably by Groome [23], who re-measured, 18 years later, an untended stand of 10 acres measured by Wigg in 1931 at Ichemba, Tabora, in natural *Brachystegia* woodland. The 279 Muninga measured in and about the quadrat-charted area represent a high concentration for the species. The height and girth classes of the second measurement show a normal-frequency type of distribution, the modes (and ranges) being respectively 30–35 (5–50) ft. and 24–32 (5–80) in. This distribution suggests an even-aged stand, resulting, it is thought, from a reversion to forest from cultivation. An investigation by Foggie's method [17] of the 81 fastest growing stems and of the 84 stems classified as dominants at the second measurement, resulted in estimated ages for the 5-ft.-girth tree of about 145 and 175 years respectively. The number of stems in the lowest age classes of Groome's tables are admitted by him to be insufficient. The data they yield are not supported by the growth of open-grown Muninga at Morogoro or that of the late-burned natural regeneration at Ndola (see sections 9 and 11), nor by the ring counts on young forest stems made by Groome himself, who finds generally that his ring counts would halve the rotations indicated by Foggie's method. The m.a.i.%, based on final girths, of the 81 fastest growing trees for the seven girth classes 0–8 to 48–56 in. were respectively 2·08 (1), 1·93 (8), 1·72 (14), 1·63 (23), 1·62 (24), 1·33 (6) and 1·51 (5), the bracketed figures being stem numbers. The largest girthed tree (79·5 in.) had a m.a.i.% of 0·56.

Ring counts are unfortunately bedevilled by bands of parenchyma and possibly by false rings resulting from defoliation (fire or breaks in the rains). The lines of conspicuously larger vessels, which are fairly clear in the heartwood, appear to constitute the safest guide (see section 14). Treatment

with iodine and photography with appropriate filters have been suggested. Groome has also measured all the Ichemba trees at 1-ft. intervals from ground level to 6 feet and shown the o.b. girths at these heights as percentages of those at ground level and breast height for each girth class.

From ring counts on 10 butt logs at 2 feet and using appropriate bark allowances and a general taper factor of 0·90 for all radii, he gives a table showing the following girths (in.) at breast height o.b. for each inch of radius from 1 to 10:

G.b.h.	7	14	19·75	25·75	31·12	36·4	43·12	49·4	55·25	61·25
					the corresponding numbers of rings being:					
	11	20·7	28·5	35·5	43	50·3	58·2	66·5	72·2	80·4

From this table, 80 years are required to grow a tree of 5 ft. girth. The number of rings per inch averaged 7·6 (cf. 6 rings/in. in section 14). Turning to S. Rhodesia, an application of Foggie's method to the 90 fastest growing trees of the Gwaai sample plot [64] indicated that a tree of 15 in. d.b.h. (47 in. girth) could be produced in 72 years. With a rainfall of only 22 in. and the occurrence of frosts, site conditions there are considered to be comparatively hard. At Fuller, open-grown trees that were 8·6 and 9·4 in. d.b.h. in 1921 had attained 22·5 and 23·5 in. in 1954 and 1956 respectively [64], a mean annual diameter increment of about 0·42 in. For Mozambique, Andrada [2], without adducing figures in support, conveniently equates d.b.h. in cm. with age in years at the points 20, 40 and 70. English girth equivalents in inches are 24·7, 49·5 and 86·6—figures considerably in excess of those already suggested, but it is generally accepted that large Muninga and good conditions for its growth are to be found in Mozambique.

Total Height. Data here are available only from Tanganyika and Mozambique. All the stems at Ichemba were measured for total height and bole length, and classified for dominance in both 1931 and 1949, heights being taken against a graduated pole. Ring counts of young trees at ground level and breast height, made by Groome, indicate a total height of 21·5 ft. in 16 + 7 + 2 years (additions for establishment and growth to breast height). For the first 4 rings, the height m.a.i. averaged over 2·5 ft., the annual rate falling later to less than one foot. These rates, as has already been mentioned, are not as high as those reported for open-grown stems at Morogoro and the late-burned plot at Ndola (see sections 9 and 11). Groome's ring counts show that it takes 2 years to reach breast height from ground level. Counts at 6–9 in. below ground, a difficult operation, showed a mean of 7·6 rings (range 0–14) more than at ground level, possibly indicating the period of about 10 years, under natural conditions, for a seedling to reach breast height.

Bole Length. Owing to the shortness and ease of definition of the bole (measured to the first large branch of the crown), data on bole length are more reliable than for total height. Measurements of 1244 sample trees in extensive enumerations [23] in the Western Province, Tanganyika, show lengths varying from a mean of 10·66 ft. for the 4–6 in. quarter-girth class to about 13 ft. for those over 10 in. in quarter girth. Groome gives the general bole length as 30–40% of total height. A figure of 57% has already been mentioned for Mozambique (section 3). Initial experiments carried out by Groome suggest that bole length could be improved 20–25% by early pruning.

Taper. Groome's taper tables [23] for measurements from ground level to 6 ft. have been referred to under *Girth and Diameter*. The latter height is very near the mid-girth of the single log that is generally won from the tree. Another table given by Groome relates stump girth, mid-girth of log and log length. Taper from breast height upwards is 2 to 2·5% for each linear foot of log, and the mid-girth of the log of mature trees yielding a single log up to 16 ft. long almost invariably exceeds 90% of the breast-height girth.

Bark Allowance. Data here are scanty. Groome has published the following ratios, the first figure being girth o.b. (in.) and the second the % reduction to find girth u.b.:

$$6/25,\ 12/16{\cdot}6,\ 18/12{\cdot}5,\ 24/10,\ \geqslant 30/8{\cdot}3\%.$$

In S. Rhodesia, measurements down to 6 in. timber diameter in 108 trees showed that 35, 15·5 and 49·5% of total volume were respectively exploitable bole, exploitable branchwood and non-exploitable. In the larger trees the bark % of exploitable bole and branchwood was respectively 27 and 29%, that of the small trees 31 and 30% [64].

Volume. A Hoppus volume table is given by Groome for 8 localities and quarter-girth classes of 4, 5, 6 . . . 18 in. The mean volumes per tree for the classes from 12 in. upwards are: 11·13, 12·97, 15·16, 17·31, 20·59, 22·55 and 25.04. The corresponding Ichemba values are: 14·8, 17·4, 20·0, 23·2, 26·5, 30·1 and 33·6 H.ft. In a volume table from Gwaai, S. Rhodesia [64], based on 1393 stems, 88 of which were felled, and relating diameters to tree volume, the volumes of the 15, 16 . . . 23-in. diam. gradations, viz. 15·8, 18·9, 22·0, 25·2, 28·4,

31·6, 34·9, 38·2 and 41·5 cu. ft. very nearly parallel the Ichemba figures. This table terminates at 51·5 cu. ft. for a tree of 26 in. d.b.h. The following data are taken from Andrada's table [2], which combines total height and diameter measurements, recorded in the Derre district, with data from 398 trees in the Beira district (where growth is said to be somewhat superior). The relation of total height and diameter is stated to be irregular, but mean figures give the following pairs of values, the first being the breast-height diam. (cm.), the second the height (m.):

35/18·3, 40/19·4, 45/20·9, 50/22, 55/23, 60/23·8.

Bole lengths, based presumably on measurements, are taken at $\frac{4}{7}$ total height to give corresponding bole volumes of 0·96, 1·30, 1·73, 2·24, 2·83, 3·5 cu.m.

At the 4- and 5-ft. girth levels these volumes are respectively 3 and 4 times those of Gwaai and Ichemba, a difference largely due to bole length. A column in Andrada's volume table gives sawn outturn at 60% of the bole volume, a figure admittedly allowing for some timber from the larger branches. The record log of 30 ft. by 10 ft. mid-girth reported for N. Rhodesia may be compared with the longest bole of this table of over 40 ft. with a b.h. girth of 74 in. (60 cm. diam.). No sawn-outturn tables based on measurements at sawmills appear to have been published.

Pedro [42], investigating the quantities available for pulping (for which the species is not recommended), reproduces a volume table evidently based on the Beira data already mentioned. The timber (down to 30 cm. diam.) is quoted in cubic metres and both the smallwood (down to 5 cm.) and the branchwood (less than 5 cm.) in kilograms. The following values against d.b.h. in cm. are extracted:

Diam., cm.	Timber, cu.m.	Smallwood, kg.	Branchwood, kg.
30	0·619	88	17
40	1·167	404	60
50	1·906	720	103
60	2·844	1,036	145
80	5·358	1,668	231

13. Management: Enumerations, Yield Regulation

Growing-stock Data and Exploitable Size. Extensive enumerations of forests containing Muninga have been made in the Rhodesias and in Tanganyika, both in the Western Province and in connexion with the groundnut clearance scheme. The only published data appear to be those of Groome [23], which cover stem frequencies by girth classes per acre for each of 13 localities, and volumes by girth classes for each of nine. The precision of these enumerations has been investigated by Griffith [22]. The minimum exploitable b.h. girth has for many years been 60 in. in Tanganyika. In S. Rhodesia a consideration of bark, sapwood and heartwood proportions has led to the adoption of 50 in., while in Mozambique [2] a minimum b.h. diameter of 40 cm. (49·5 in. girth) has been laid down. Data for the proportions of heartwood and sapwood over the whole diameter range are not available, but sapwood may be considered a defect in prime boards although some makers sell furniture containing both, claiming a decorative effect for the contrast of yellow and deep browns. A disc from the butt (see section 14) with a mean diameter u.b. of 23·5 in. had 1·25 in. of sapwood, which was contained in the last 12 growth rings. Pedro [42] states, without adducing any data, that sapwood is 10–15% of the total volume.

Yield Regulation. Groome [23] has tabulated annual production from the Western Province, Tanganyika, for the 20 years to 1955. He estimates a total outturn for the period of 6,000,000 Hoppus feet u.b. The productive area in the Tabora district, which has produced 90% of this total, is about 15,000 sq. miles, of which 6000 have been heavily exploited. The local sawmills, with a maximum monthly capacity of 100 tons sawn timber each, are cutting over their concession areas at the rate of 750 sq. miles in 2 or 3 years. In the period 1950–55 six such mills have together cut about 2,500,000 Hoppus feet, at the rate of 25–30 H.feet/sq. mile/year. Most of the Tabora district is now under a simple form of yield regulation, the permissible annual cut being calculated by a form of Brandis' method [27*a*]. The annual yields prescribed vary from 23 to 37·5 cu. ft./sq. mile. As Jerram [27*a*] points out, Brandis' method was devised *ad hoc* for controlling the yield of the Pegu forests (Burma), which contained some 10% Teak. The object was to bring these forests rapidly under a selection system, in conditions of general silvicultural ignorance. Although individual stands of Muninga are mainly even-aged, their distribution over an immense area, with the greater part of the age range represented, was thought to warrant placing them under a type of group-selection system to which Brandis' method might appropriately be applied. As Groome's is the most thorough-going calculation published, it is given in some detail. His data are arranged in five quarter-girth classes from 3–6 in. to 15 in. and over. With corresponding survivals from each class estimated at 20, 50, 70, 85 and 95%, the reduced numbers of stems per acre in each class are 0·642, 0·785, 0·266, 0·153 and 0·038, total

1·884 per acre. With a rotation of 165 years (which is divided into 5 periods of 33 years) the ages of the tree of 3 in. and 15 in. q.g. are respectively 43 and 165 years, and it takes the former 122 years (165 minus 43) to reach exploitable size (class I). The annual yield, then, is based on the number of trees reaching class I, i.e. the sum of classes II to V or, on an acre basis, 1·846 divided by 122, which gives 9·66 trees/sq. mile/year. A large deficit in class I trees reduces this to 5·2 trees/sq. mile. Groome outlines for the Western Province a four-stage plan for reservation, enumeration and yield regulation, the latter based on the Brandis method with checks by two other methods and comparative calculations for another five.

In other territories more optimistic estimates of the rotation have been offered. These range from 40 to 75 years, but for the most part without supporting data or calculations [2, 42, 64]. However, Groome has indicated that 6 of the untended Ichemba trees [see p. 156] were growing nearly one inch in girth each year, or 60 inches in 60 years. This rate would appear to be obtainable under optimum conditions with good silvicultural treatment. Adopting Groome's ring-count scale and adding 10 years to cover the period of establishment and growth to breast height [section 12], the tree of 3 in. q.g. would be 18 + 10 and the tree of 15 in. q.g. 80 + 10 years old. With a 90-year rotation it would take the former 62 years (90 minus 28) to reach class I, giving a yield of 1·846 divided by 62 trees/acre or 19 trees/sq. mile/year, which, after spreading the deficit adjustment over the period (18 years), as before, reduces to 10·8 trees/sq. mile/year. Andrada's calculation of yield in Mozambique [2] is based on 14 sample enumerations totalling 6·5 ha. of *Brachystegia/Julbernardia* forest, showing a total of 114·534 cu.m. sawn outturn. The diameter-class distribution is normal (mode 35–40 cm. and range 5–75 cm.), which for him justifies the regulation minimum exploitable b.h. diameter of 40 cm. (49·5 in. girth). To reach this diameter is assumed to take 40 years (66 in Groome's ring-count scale) and the annual yield is therefore 17·621 cu.m. of sawn material divided by 40, or 0·441 cu.m./ha. (6·3 cu. ft./acre). With various stated reductions, he estimates that a fiftieth part of the 170,000 ha. comprising the Derre District carries this stocking, giving him an annual yield for the district of 1499 cu.m. (52,940 cu.ft.) sawn outturn. By comparison, for the Manica and Sofala area of Mozambique, Pedro [42] estimates that the area occupied by Muninga is about 400,000 ha. with 3 cu.m./ha. exploitable. Assuming a rotation of 50 years, he arrives at an annual sustained yield of 24,000 cu.m., almost double the amount (13,500 cu.m.) exploited annually in the 1946–50 quinquennium from that area. Nevertheless he states that the rate of cutting of this species for export, for internal use and in clearing for native agriculture, makes provision for its systematic regeneration, both natural and artificial, urgent. These suggestions of 40- and 50-year rotations appear to be the most optimistic yet published.

14. Timber Properties and Uses

Physical and Mechanical Properties. According to *A Handbook of Hardwoods* [60], from which this account is mainly taken, the timber bears a general superficial resemblance to the other timbers of the genus, e.g. Andaman and Burma Padauk, but is lighter and softer. The heartwood is light to medium chocolate-brown, often with a pink or purple cast and with darker streaks; on long exposure it becomes a golden brown but retains its irregular darker markings. In sharp contrast the sapwood, about 1·5 in. wide, is pale. The grain is rarely straight, its irregular interlocking often enhancing the natural figure, so that the timber is remarkably handsome [56]. The weight varies considerably, the range and mean in lb./cu. ft. being 30–49 and 39 respectively for seasoned timber, while the green weighs about 67 lb./cu. ft.

The timber seasons very well but rather slowly, especially thicker, quartered material. There is little splitting either in the wood or knots, and little distortion. Schedule J [60] gives good results. From green to 12% moisture content, the tangential and radial shrinkage are about 1·5 and 1% respectively, indicating very high stability. Movement in service in the corresponding senses is small, severe tests giving figures respectively of 0·6 and 0·5%.

The strength varies with the widely varying grain characteristics, some logs having straight, others interlocked and pronounced curly grain. The mean values of tests on timber at 12% m.c. which follow, provide only an indication of what may be found in a parcel of Muninga. They are taken from a recent summary [51] where further data can be found. The original sources are publications of the Forest Products Laboratory at Princes Risborough [9], from whose handbook the comparative rating following the statistic is quoted [60]: Specific gravity 0·5, medium; modulus of rupture, 13,200 lb./sq. in., medium; modulus of elasticity, 1200 lb./sq. in., very low; impact strength (drop of 50 lb. weight to failure), 34 ft., low; crushing strength, 7280 lb./sq. in., medium.

The timber is only moderately amenable to bending. Under standard test conditions the ratios of radius to wood thickness for solid (steamed) bends, supported and unsupported, were respectively 16·5 and 18 to give 95% faultless bends. Tests in Africa [61] show that the heartwood is highly

resistant to termites and indicate good resistance to marine borers. The sapwood is rapidly reduced by powder-post beetles (Bostrychidae and Lyctidae) [50]. Findlay [16], testing the timber against 3 species of brown and 3 of white rots, found the loss in weight with two white rots to be 2·1 and 2·9% respectively and negligible with the others (see also Scott [46]). The timber is extremely durable, resisting fungi and termites for many years [12] when exposed to soil and weather. It has a medium resistance to cutting tools and a moderate blunting effect. It works readily in all hand and machine operations. In planing, figured timber tends to 'pick up', and a cutting angle of 20° is needed. The timber turns well and takes nails and screws readily. The usual finishing treatments give excellent results and gluing is satisfactory. For rip-sawing with a spring-set circular saw at rim speeds of 9000–10,000 ft./min. the E type saw [60] is recommended (54 teeth; pitch (in.) = diam. × 0·0582; hook for green and seasoned material 25 and 20° respectively; clearance 15°; top bevel 10°; depth of gullet = pitch × 0·4).

Microscopic Characters. The following are the punched-card specifications from the Forest Products Laboratory lens key [57]. Simple perforation plates and deposits of gum present in the vessels, which are 0·05–0·30 mm. diameter and 65 to < 12 per 10 sq. mm. of cross-section. Parenchyma distinct to the naked eye, vasicentric, aliform, banded and also in fine lines. Rays fine, < 0·05 mm. broad, storeyed, 25–80 per 5 mm., sometimes 3 or more per vessel. Rings sufficiently distinct to be counted over a considerable radius, with a suggestion of ring-porousness, the vessels of the early wood being distinctly larger. [Illustrations in 8, 15, 26, 28, 42, 56, 58.]

For an accurate count of annual rings at least 3 radii should be cleaned; the colour contrasts seen by reflected light are an aid. The previous season's growth is demarcated by a dark firm line of fibres behind which in the older tissue is an almost continuous band of a light-coloured parenchyma. In the new growth, a line of larger vessels stands out at the inner edge of a light-coloured band which may occupy a quarter of the width of the ring. This band is in strong contrast on the one side with the dark terminal fibre line of the last season's growth, and in lesser contrast on the other with the bands of parenchyma that become increasingly confluent in the zones of darker and thicker-walled fibres of the later wood. The mean count along 3 radii of a butt-log disc examined at the Imperial Forestry Institute, Oxford, for successive distances of 2 inches from the pith were 11·7, 12·3, 12·0, 10·7 13·3 (14·3, 9·1), giving 60 rings in the first 10 inches.

Uses. Muninga is a handsome timber for panelling and furniture (Johannesburg Railway Station; Forest Products Research Laboratory, Princes Risborough; Imperial Forestry Institute, Oxford) and for high-class joinery. It is moderately resistant to wear and, as flooring, should be confined to moderate pedestrian traffic. Out of a catalogue of other common uses the following may be mentioned: general construction, railway sleepers and carriage work; ship construction (Nyasaland Marine Department), native sailing ships, and canoes; floor blocks and strips, top-quality coffins, naves and felloes, turnery; and native stools, trays and drums. It is peeled in S. and Central Africa for face plies of high value [44]. The sapwood is used for box shooks (beer crates). A detailed investigation [42] which covers chemical analysis and minor products comprehensively, shows that the wood is valueless for pulping. As regards minor products, Africans make bags from the bark, a cosmetic of the ground wood, medicines etc. No instance has been noted of the use of the kino in European medicine though that of *Pterocarpus erinaceus* (from Africa) and *P. marsupium* (from India) have been so used as astringents. Detailed work has been done on the heartwood extractives [29, 30].

In his table of the sizes of the main building hardwoods imported into the United Kingdom, Jay [27] gives the available sectional sizes of square-edged Muninga stock as 6–12 in. wide, 1–3 in. thick, and strips of 1 × 3 in. Lengths are 6–16 ft. Much of the timber exported to South Africa is in log or square-baulk form, some of fairly large dimensions.

References

[1] Acocks, J. P. H. (1953) Veld types of South Africa (with 5 small vegetation maps and accompanying veld type map). *Mem. bot. Surv. S. Afr.* No. 28. [*F.A.* 15 No. 1223.]

[2] Andrada, E. Campos. (1951) A concrete example of the forest resources of Mozambique. Some observations made in the Derre Region. *Agros* 34 (67–81). [*F.A.* 13 No. 4081.]

[3] Aubréville, A. (1949) Climats, forêts et désertification de l'Afrique tropicale. Société d'Éditions géographiques, maritimes et coloniales, Paris. [*F.A.* 11 No. 134.]

[4] Burtt, B. D. [edited by Jackson, C. H. N.] (1942) Some East African vegetation communities. *J. Ecol.* 30 (65–146). [*F.A.* 4 p. 19.]

[5] Burtt Davy, J., and Hoyle, A. C. (1936) Nyasaland Protectorate. *Check List imp. For. Inst., Oxf.* No. 2.

[6] Cardoso, J. G. Alfaro. (1951) The planting of indigenous species in Portuguese East Africa. *S. Afr. J. Sci.* 47 (264–6). [*F.A.* 13 No. 212.]

[7] „ (1952) Rapport sur le Mozambique (Afrique orientale Portugaise). [*Proc.*] *1st Conf. for. interafric., Abidjan* 1951 (546–50). [*F.A.* 16 No. 1286.]

[8] CHALK, L., BURTT DAVY, J., and DESCH, H. E. (1932) Some East African Coniferae and Leguminosae. *Forest Trees and Timbers of the British Empire, Imperial Forestry Institute, Oxford* No. 1.
[9] COX, H. A. [Editor]. (1939) A handbook of Empire Timbers. H.M. Stationery Office, London. [*F.A.* 1 p. 311.]
[10] DELEVOY, G. (1929) La question forestière au Katanga (Congo belge). Vol. II. J. Lebegue et Cie, Brussels.
[11] DESCH, H. E. (1949) Teak alternatives. *Timb. & Plyw.* 97 (2505), (62, 64). [*F.A.* 11 No. 1082.]
[12] DUFF, C. E. (1944) Termite resistance test on the Copperbelt of Northern Rhodesia. *Emp. For. J.* 23 (160–2). [*F.A.* 7 No. 262.]
[13] DUVIGNEAUD, P. (1952) La flore et la végétation du Congo méridional. *Lejeunia, Liége* 16 (95–124).
[14] FERREIRINHA, M. P. (1954) Notes on overseas timbers. Series 1. *Estud. Inform. Serv. flor. aqüic. Portugal* No. 21-*D*3. [*F.A.* 15 No. 3992.]
[15] ,, (1954) Timbers of Mozambique from the collection in the wood anatomy and technology laboratory of the Junta de Investigações do Ultramar. *Garcia de Orta, Lisboa* 2 (227–30). [*F.A.* 16 No. 2114.]
[16] FINDLAY, W. P. K. (1938) The natural resistance to decay of some Empire timbers. *Emp. For. J.* 17 (249–59). [*F.A.* 1 p. 43.]
[17] FOGGIE, A. (1945) On girth increment and age of trees with special reference to management in irregular tropical forest. *Emp. For. J.* 24 (176–91). [*F.A.* 8 No. 751.]
[18] GILLMAN, C. (1949) A vegetation-types map of Tanganyika Territory. *Geogr. Rev.* 39 (1), (7–37). [*F.A.* 11 No. 139.]
[19] GLOVER, P. E. (1939) A preliminary report on the comparative ages of some important East African trees in relation to their habitats. *S. Afr. J. Sci.* 36 (316–27). [*F.A.* 3 p. 32.]
[20] GOMES E SOUSA, A. DE F. (1943) Forest species of Inhambane. Imprensa Nacional de Moçambique, Lourenço Marques. [*Biol. Abstr.* 19 No. 3623.]
[21] GOSSWEILER, J., and MENDONÇA, F. A. (1939) Phytogeographical atlas of Angola. Ministério das Colónias, Lisbon. [*F.A.* 9 No. 143.]
[22] GRIFFITH, A. L. (1952) East African enumerations. *Pterocarpus angolensis* in mixed woodland (Tanganyika). *Emp. For. Rev.* 31 (146–9). [*F.A.* 14 No. 538.]
[23] GROOME, J. S. (1955–6) Muninga (*Pterocarpus angolensis* DC.) in the Western Province of Tanganyika. *E. Afr. agr. J.* 21 (130–7, 189–200, 248–54). [*F.A.* 17 Nos. 1307, 4263, 4342.]
[24] HAUMAN, L. (1954) *in* Flore du Congo belge et du Ruanda-Urundi. Spermatophytes Vol. VI. Papilionaceae (troisième partie). Institut national pour l'Étude agronomique du Congo belge, Brussels. [*F.A.* 16 No. 3824.]
[25] HENKEL, J. S. (1931) Types of vegetation in Southern Rhodesia. *Proceedings of the Rhodesia Scientific Association, Bulawayo* 30 (1–23).
[26] JANE, J. W. (1953) The structure of world timbers. 19. Muninga, Musizi and Muzaiti. *Timber Technol.* 61 (323–5). [*F.A.* 16 No. 2138.]
[27] JAY, B. A. (1956) Sizes of timber. *Wood* 21 (276–9; 311–3). [*F.A.* 18 No. 834.]
[27*a*] JERRAM, M. R. K. (1949) Elementary forest mensuration. Thomas Murby & Co., London.
[28] JOHNSTON, D. R. (1952) Structure drawings to 'Specimen Woods'. Sheet 18. *Wood* 17 (475). [*F.A.* 14 No. 2599.]
[29] KING, F. E., KING, T. J., and WARWICK, A. J. (1952) The chemistry of extractives from hardwoods. Parts VI and VII. *J. chem. Soc.* 1952 (96–100; 1920–4). [*F.A.* 13 No. 4223; 14 No. 670.]
[30] KING, F. E., and JURD, L. (1952) The chemistry of extractives from hardwoods. Part VIII. *J. chem. Soc.* 1952 (3211–5). [*F.A.* 14 No. 1532.]
[31] KING, F. E., *et al.* (1953) The chemistry of extractives from hardwoods. Part XIII. *J. chem. Soc.* 1953 (3693–7). [*F.A.* 15 No. 1788.]
[32] LAMB, G. N. (1950) Foreign woods—origin, use, properties and nomenclature. *Wood Prod.* 55 (7), (26–7). [*F.A.* 12 No. 1133.]
[33] MARSTRAND, E. B. (1954) Relation between increase in girth of the cambium and fibre and tracheid length with special reference to *Pterocarpus angolensis*. Special Subject, Imperial Forestry Institute, University of Oxford. [Not published.]
[34] MARTIN, J. D. (1940) The *Baikiaea* forests of Northern Rhodesia. *Emp. For. J.* 19 (8–18). [*F.A.* 2 p. 125.]
[35] MILLER, O. B. (1939) The Mukusi forests of the Bechuanaland Protectorate. *Emp. For. J.* 18 (193–201). [*F.A* 1 pp. 226–7.]
[36] ,, (1948) Bechuanaland Protectorate (provisional list). *Check List imp. For. Inst., Oxf.* No. 6. [*F.A.* 10 No. 87.]
[37] MILNE, G. *et al.* (1936) A provisional soil map of East Africa. *Amani Memoirs, East African Agricultural Research Station, Amani.*
[38] NORTHERN RHODESIA. (1956) Damage by elephants. *Rep. For. Dep. N. Rhod.* 1955 (4). [*F.A.* 17 No. 4125.]
[39] NYASALAND. (1945) *Rep. For. Dep., Nyasald.* 1944 (3). [*F.A.* 8 No. 187.]
[40] PARDY, A. A. (1951) Notes on indigenous trees and shrubs of S. Rhodesia. *Pterocarpus angolensis* D.C. *Rhod. agric. J.* 48 (322). [*F.A.* 13 No. 1886.]
[41] PARRY, M. S. (1954) Tree planting in Tanganyika. III. Species for dry areas. *E. Afr. agric. J.* 19 (154–60). [*F.A.* 15 No. 3438.]
[42] PEDRO, E. R., *et al.* (1955) *Pterocarpus angolensis* DC. *Garcia de Orta, Lisboa* 3 (11–31). [*F.A.* 17 No. 778.]
[43] POLE EVANS, I. B. (1936) A vegetation map of South Africa. *Mem. bot. Surv. S. Afr.* No. 15.
[44] RINDEN, R. W. (1946) Plywood in South Africa. *Sth. Lumberm.* 173 (2177), (306).
[45] SCOTT, M. H. (1941) The properties and uses of South African Kiaat (*Pterocarpus angolensis*) timber. *J. S. Afr. For. Ass.* No. 7 (61–6). [*F.A.* 4 p. 170.]
[46] ,, (1949) Dry rot in building timbers. *Bulletin, National Building Research Institute, Pretoria* No. 3 (39–45). [*F.A.* 12 No. 571.]

[47] Scott, M. H. (1950) Notes on the more important African timbers imported into the Union, with special reference to Portuguese East Africa. *J. S. Afr. For. Ass.* No. 19 (18–62). [*F.A.* 12 No. 339.]
[48] ,, (1953) Utilization notes on South African timbers. *Bull. Dep. For. S. Afr.* No. 36 (5–95). [*F.A.* 15 No. 2799.]
[49] Shantz, H. L., and Marbut, C. F. (1923) The vegetation and soils of Africa. American Geographical Society, New York.
[50] Southern Rhodesia. (1942) *Report, Division of Entomology, Department of Agriculture and Lands, Salisbury 1941.* [*F.A.* 5 p. 39.]
[51] Spalt, H. A., and Stern, W. L. (1956) A survey of African woods. *Trop. Woods* No. 105 (13–38).
[52] Trapnell, C. G., and Clothier, J. N. (1937) The soils, vegetation and agricultural systems of North-Western Rhodesia: report of the ecological survey. Government Printer, Lusaka.
[53] Trapnell, C. G. (1943) The soils, vegetation and agriculture of North-Eastern Rhodesia: report of the ecological survey. Government Printer, Lusaka. [*F.A.* 6 p. 271.]
[54] Trapnell, C. G., *et al.* (1947) Vegetation-soil map of Northern Rhodesia, with an explanatory memoir. Government Printer, Lusaka. [*F.A.* 10 No. 96.]
[55] Troup, R. S. (1921) The silviculture of Indian trees. Vol. I. Clarendon Press, Oxford.
[56] United Kingdom.(1942) Specimen woods No. 76. Kejaat (*Pterocarpus angolensis*). *Wood* 7 (65–6).
[57] ,, (1952) Identification of hardwoods: a lens key. *Bull. For. Prod. Res., Lond.* No. 25. [*F.A.* 14 No. 616.]
[58] ,, (1953) An atlas of end-grain photomicrographs for the identification of hardwoods. *Bull. For. Prod. Res., Lond.* No. 26. [*F.A.* 15 No. 1730.]
[59] ,, (1954) The movement of timbers. *Leafl. For. Prod. Res., Lond.* No. 47. [*F.A.* 16 No. 3366.]
[60] ,, (1956) A handbook of hardwoods. H.M. Stationery Office, London. [*F.A.* 17 No. 4376.]
[61] Wigg, L. T. (1946) Durability of some East African timbers. *E. Afr. agric. J.* 12 (90–100). [*F.A.* 8 No. 2459.]
[62] ,, (1953) Problems of dry forest silviculture in Tanganyika. *Emp. For. Rev.* 32 (212–21). [*F.A.* 15 No. 1237.]
[63] Willan, R. G. M. (1940) Notes on the vegetation of Northern Nyasaland. *Emp. For. J.* 19 (48–61). [*F.A.* 2 p. 125.]
[64] Unpublished data from the Forest Departments of N. Rhodesia, Tanganyika and Union of S. Africa, and the Southern Rhodesia Forestry Commission.

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ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 1588, 1671, 1987, 2062, 2095–6, 2135, 2137, 2146, 2157, 2165, 2244.

0 (048.1). Bibliographical Lists

See also Nos. 1731, 1832, 2152, 2154, 2217.

1219. **Israel forestry abstracts.** Department of Forests, Ilanoth. 1956. pp. v + 59. [E.]

Contains 355 titles from forestry literature published in Israel and from literature published elsewhere dealing with forestry and forest products in Israel, usually with brief abstracts. The list covers literature from about 1920 and it is hoped to publish future lists every 2 years. Items are arranged by the Oxford decimal classification; there is an author index.

1220. Olsen, L. P., and Woodworth, H. A. **Publications of the Lake States Forest Experiment Station 1923–1955.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 39, 1956. pp. 130.

Classified by author under 20 subject heads plus lists of (*a*) Technical Notes, under the same subject heads and (*b*) Station Papers, Miscellaneous Reports and Aspen Reports, each in serial order, with an author index.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

See also Nos. 1505, 2372.

1221. ***Publications du Service des Forêts de l'Algérie.*** Service des Forêts de l'Algérie, Alger.

The first number, in French, was published in 1956. Citation in *F.A.*: *Publ. Serv. For. Alger.*

0 (084.3/4). Maps. Atlases

1222. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. [**Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi.**] I.N.É.A.C., Bruxelles, 1955–56. [F.]

[Cf. *F. A.* 17 No. 2371.] The parts here noticed are: (1) *Kaniama* (*Haut-Lomani*)—(*A*) Soils (1 : 100,000 reconnaissance map; 1 : 25,000 map of Tshibonde region); (*B*) Vegetation (1 : 50,000 reconnaissance map; 1 : 25,000, Tshibonde region); (*C*) Land use (1 : 25,000, Tshibonde region); Explanatory note (pp. 53; 21 refs.).

(7) *Bugesera—Mayaga* (*Ruanda*)—(*A*) Soils, (*B*) Vegetation, (*C*) Land use (all 1 : 100,000); Explanatory note (pp. 57; 16 refs.).

0 - - 011. Terminology. Nomenclature

See Nos. 1231, 1747.

0 - - 019. Miscellaneous Research Methods (including Photography)

1223. Dwyer, G. D. **Ground stereopair photographs.** *For. Chron.* 32 (3), 1956 (309–12). 2 refs.

Describes a method of taking stereopairs from the ground, using an ordinary hand camera without tripod or stereo attachment head. The camera is held on the left side of the body, the picture taken, and, keeping the camera in the same horizontal plane, another picture is taken ca. 6 in. to the right of the first, the camera being aimed at the same spot for both pictures.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.2. Radiation and Temperature

See also No. 1225.

1224. Evans, G. C. **An area survey method of investigating the distribution of light intensity in woodlands, with particular reference to sunflecks.** *J. Ecol.* 44 (2), 1956 (391–428). 17 refs.

A system is discussed for surveying light over a large area and for measuring sunflecks, their area, distribution and intensity. A portable apparatus devised for these purposes is described and illustrated; it consists of a boxed-in photo-electric cell, capable of surveying 30 sq. m. in an hour. A full analysis is given of a sample of data from Nigerian rain forest where 20–25% of the area of the forest floor is occupied by sunflecks at midday. Consistency tests show that the sets of observations were large enough for a pattern of the distribution of light between sunflecks and shade to emerge. The precautions necessary to avoid meaningless readings are detailed, and suitable procedures for sequences of

observations are worked out. The use of the area-survey method as applied to certain other types of woodland is discussed and the information obtained considered from its autecological aspect.

111.5. Wind

See Nos. 1622–5, 1633.

111.8. Climatology. Climate and Microclimate

See also Nos. 1268, 1363–4, 1750, 1872, 1916–7, 1983–5.

1225. DUNIKOWSKI, S. Badania nad przebiegiem skrajnych temperatur powietrza w Wielkopolskim Parku Narodowym. **[Investigations on the variation in extreme air temperatures in the Wielkopolski National Park.]** *Roczn. Nauk leśn.* No. 14, 1956 (293–316). 11 refs. [Pol.pol.russ.e.]

Presents the results of daily measurements taken in 1949–51 at heights of 5, 50, 100 and 200 cm. above ground. In most cases extreme temperatures within the stand were less extreme than outside it. The existence of temperature strata in the forest was established. The greatest temperature amplitudes outside the forest occur in the layer near the ground; in the stand this layer participates very little in the daily temperature variation. The temperature amplitudes in individual strata were greatest in summer, and least in autumn and winter; so also were the temperature differences between the air within and outside the stands.

114. Soil. Soil Science

1226. DUCHAUFOUR, P. Pédologie: applications forestières et agricoles. **[Soil science: its silvicultural and agricultural applications.]** École Nationale des Eaux et Forêts, Nancy. 1956. pp. 310 + 4 photos, 1 tbl. 12 pp. of refs. [F.]

A general treatise in two parts: (I) soil properties (morphology, physical properties, water relations, chemical properties, biological properties); (II) genesis and evolution of soils (including a chapter on tropical soils); with annexes on soil conservation, surveying and mapping, and soil analysis.

114.1. Soil Physics

See also Nos. 1238, 1244, 1255, 1488, 1490, 1817.

1227. ŠIŠKOV, K. N. Formuly dlja opredelenija vodnyh svoïstv počv Prikaspiïskoï nizmennosti po dannym mehaničeskogo i mikroagregatnogo sostava. **[Formulae for determining the water properties of soils in the Caspian depression from data on their mechanical and microaggregate composition.]** *Soobšč. Inst. Les.* No. 1, 1953 (82–6). 1 ref. [Russ.]

From observations on 34 different soil types and varieties the author deduces empirical regression equations for determining field moisture capacity, maximum hygroscopic moisture and infiltration rate.

1228. TROEDSSON, T. Marktemperaturen i ytsteniga jordarter. **[Soil temperatures in soils with stony surface layers.]** *Skr. K. Skogshögsk., Stockh.* No. 25, 1956. pp. 22. 29 refs. [Sw.sw.e.e.] Price *Kr.*3.

Tables and graphs are given showing results of measurements on 3 plots in mixed Pine/Spruce forest in N.E. Dalecarlia, (*a*) poor, (*b*) fairly rich, and (*c*) rich in stones, and on another plot where the surface had been covered with stones to depths of 10, 20 and 30 cm. or left bare. Summer temperatures in (*c*) were 1–3° C. higher and winter ones slightly higher than those in (*a*); temperatures at the spring and autumn equinoxes were roughly the same on all plots, possibly slightly lower on (*c*). Temperatures rose more rapidly in spring in the stony plots. Differences decreased at depths > 10 cm. Increasing the thickness of the stony layer above 10–15 cm. appears unlikely to increase soil temperature but might well create unfavourable moisture conditions. It seems doubtful whether the slight increase in temperature at the lower depths (1° C or less at 15 cm.) will have any positive effect on growth.

114.2. Soil Chemistry

See also Nos. 1233–6, 1244–7, 1250.

1229. THEMLITZ, R. Die Stickstoffestlegung aus schwefelsaurem Ammoniak durch Fichtenrohhumus bei verschiedener Reaktion. **[The fixing by Spruce raw humus of N from $(NH_4)_2SO_4$ at different pH values.]** *Z. PflErnähr. Düng.* 73 (3), 1956 (202–9). 8 refs. [G.g.] O.R.S.

Results of laboratory experiments showing: direct relationship of fixed N and sorption capacity of raw humus to pH value; washing of exchangeable N from raw humus even at low pH; increased water solubility of humus matter with increasing pH to pH 5, followed by decrease.

1230. ŠTOBE, G. **Nitrogen content in Latvian forest soils.** *Latvijas PSR Zinatnu Akademijas Vestis* 1953 (8), (70–4). [Latv.russ.] From *abstr.* in *Chem. Abstr.* 50 (19), 1956 (14157). D.S.I.R.

The C/N ratio was lower in the deeper soil layers. In neutral clay-bearing soils of broadleaved forests, the ratio was 15·7 in the top and 4·2–8·6 in the lower soil levels. In sandy acidic soils of coniferous forests, it was 24–44.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 1229, 1240–1, 1255–7, 1934.

1231. ZINECKER, E. Zur einheitlichen Horizontbezeichnung von terrestrischen Humusformen und Bodenprofilen. **[On the standardization of descriptive symbols for horizons, terrestrial humus forms and soil profiles.]** *Allg. Forst- u. Jagdztg.* 126 (10), 1955 (207–9). 9 refs. [G.e.]

A discussion of nomenclature and symbols proposed in the literature, with one or two further recommendations.

1232. SCHROEDER, D. Zum Einfluss von Vegetation und Bodennutzung auf die Bodenentwicklung ehemaliger Schwarzerden. **[The effect of vegetation**

and land use on the soil development of black earths.] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (143–8). 3 refs. [G.g.e.f.]

Soils in a small area in Hanover under (1) Oak/Hornbeam forest for about 3000 years, (2) arable for 1400 years, (3) pasture for 400 years, (4) arable for 150 years or (5) Spruce for 80 years showed very little difference in profile structure, mechanical and mineralogical composition, or chemistry. All were degraded, (2) and (3) slightly, (4) moderately and (1) and (5) severely.

1233. REMEZOV, N. P. **The role of the biological circulation of the elements in soils formation under the forests.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (269–74). [E.g.f.]

Discusses, with special reference to the U.S.S.R., the relation between the cycle of elements and the tendency for mixed and deciduous forests to replace conifers in favourable climates. Includes tables showing annual consumption of nutritive elements by different forest types (e.g. *Pinetum vacciniosum, Betuletum mixtoherbosum*), accumulation of elements with increasing age, and the passage of N and ash elements into the soil under important forest types and meadow-steppe.

1234. REMEZOV, N. P. Rolj biologičeskogo krugovorota èlementov v počvoobrazovanii pod pologom lesa. [**The role of the biological circulation of the elements in soil formation under forest.**] *Počvoved.* 1956 (7), (68–79 + smry. in suppl.) [Russ.f.] A.P.B.

A paper later presented to the 6th International Congress of Soil Science. [See preceding abstract.]

1235. BOSWELL, J. G. **Decay of plant litter.** *Nature, Lond.* 178 (4547), 1956 (1373–5).

A report on a symposium held at the joint session of the Botany and Forestry sections of the British Association at Sheffield, at which papers were read on: Ringinglow Bog (*J. G. Boswell*); decomposition of dead grasses (*J. Webster*); soil Acarina (*P. W. Murphy*); and the importance of litter breakdown in the woodland ecosystem (*J. D. Ovington*).

1236. MANIL, G. L'humus forestier (1re partie: propriétés générales). [**Forest humus: Part 1. General characteristics.**] *Bull. Soc. for. Belg.* 63 (11), 1956 (449–62). [F.]

A general theoretical account with no reference to particular conditions.

1237. MALLET, J., and LIWERANT, J. 'Bouconne', chênaie dégradée du pays toulousain. [**'Bouconne', degraded Oak wood of the Toulouse countryside.**] *Rev. for. franç.* 8 (11), 1956 (725–46 + 7 photos). 6 refs. [F.]

Examination and analysis of the soils in the poorest parts of these woods revealed shallow soils with a large % of fine sands and clay, underlain by a gley horizon or 'grepp' (ferruginous concretions), impenetrable by tree roots. The relative parts played by parent rock, climate, and over-exploitation in producing these conditions are discussed.

114.4. Soil Classification. Soil Types

See also Nos. 1222, 1232, 1244, 1583–6.

1238. JONGERIUS, A. Étude micromorphologique des sols sableux secs des bois et bruyères aux Pays-Bas. [**Micromorphological study of dry sandy soils under forest and heath in the Netherlands.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (353–7). 6 refs. [F.f.g.e.]

A classification for these soils was evolved, based on relative proportions of sand, matrix (binding and filling materials) and humus. Litter decomposition, vertical distribution of humus types, and the presence of traces of previous forest vegetation in heath profiles are discussed.

1239. BOURGENOT, L. La Jura siliceux. [**The flinty [soils of the] Jura.**] *Bull. Soc. for. Franche-Comté* 29 (4), 1956 (179–96). 12 refs. [F.]

Describes the areas of clay-with-flints that occur among the predominantly calcareous soils of the Jura plateaux, their vegetation and forest types, and gives some account of the growth and yield of coniferous plantations on them.

1240. CHIRITZA, C. D. Sols de forêt de la région carpathique et précarpathique roumaine, leurs successions génétiques et géographiques. [**Forest soils of the Carpathian and Carpathian-foothill region of Rumania, their genetical and geographical successions.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (637–45). 13 refs. [F.f.e.g.]

The region is subdivided into two zones: (1) the foothills and the lower mountain slopes, carrying Beech, Silver Fir, and mixed Beech and conifers, characterized by slightly to moderately acid brown soils, moderately acid podzolized brown soils and podzols, with accumulation of clay and sesquioxides in the B horizon but without accumulation of raw humus; (2) the upper and subalpine mountain slopes carrying Spruce and the lower alpine slopes carrying *Pinus mugo* and *Juniperus sibirica*, characterized by acid brown soils, acid podzolized brown soils and strongly acid podzols with heavy accumulation of humic acids and sesquioxides in the B horizon and with or, rarely, without accumulation of raw humus. The predominant altitudinal soil sequences are outlined.

1241. GRACANIN, Z. Die Beziehungen zwischen Roterden und Waldgesellschaften des kroatischen Karstgebietes. [**The relation between terra rossa and forest associations in the Croatian karst area.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (547–51). 17 refs. [G.e.f.]

Such soils are found under a variety of forest associations but never in their typical form; under *Quercetum ilicis* they show a transition towards littoral brown earths; under *Carpinetum orientalis* and *Seslerieto-Ostryetum* there is transition to brown earths, combined with a strong acidification and leaching of bases; under *Fagetum silvaticae croaticum*, development of red podzolic soil; and under *Pinetum mughi*, severe podzolization. They are considered to be relict soils.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 1407–8, 1435, 1596, 1741, 1969, 1973–5.

1242. WARD, W. T., and HOCKING, G. H. **Soils and [plantation] forestry of the northern part of Te Wera state forest.** *N.Z. J. Sci. Technol.* 38*B* (3), 1956 (157–86 + 1 map). 13 refs. P.R.

The forest potential of each soil is assessed from basic data collected during a detailed survey. Each forest compartment is assigned a species ecologically adapted to it and promising the highest utility and yield. A soil map and report are shown to be of real value in assisting the forester to plan his forest with speed and confidence. *From authors' summary.*

1243. OVINGTON, J. D. **Studies of the development of woodland conditions under different trees. V. The mineral composition of the ground flora.** *J. Ecol.* 44 (2), 1956 (597–604). 19 refs.

[Cf. *F.A.* 16 No. 2605.] In 3 different localities the ground flora in (*a*) woodland plantations and (*b*) adjoining unplanted areas were analysed for mineral elements. Their chemical compositions differed considerably according to site conditions and the established tree species. Tables show the % and total weights (oven-dry) of mineral elements in the ground flora in (*a*), under different trees, and in (*b*). In most cases (*a*) contained higher %s of nutrients than (*b*); but because of the difference in the oven-dry weights of the herb and bryophyte layers, the total amount of nutrients was larger in (*b*). The possible influence of tree-root exudates on the chemical composition of the associated plants is discussed.

114.6. Soil Biology

See also Nos. 1235, 1370–7.

1244. BERLIER, Y., DABIN, B., and LENEUF, N. Comparaison physique, chimique et microbiologique entre les sols de forêt et de savane sur les sables tertiaires de la Basse Côte d'Ivoire. **[Physical, chemical and microbiological comparison between forest and savanna soils on tertiary sands of the Lower Ivory Coast.]** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (499–502). [F.f.g.e.]

Analysis of soil samples for the neighbourhood of Daboucosrou, in the area of tertiary sand stretching along the coast and for some 60 km. inland from Sassandra to the Gold Coast, showed only rather slight differences between savanna and forest. The latter contained greater quantities of organic matter in the surface horizon; this difference would soon disappear under cultivation, though beneficial during the first year to crops grown on forest land.

1245. DOMMERGUES, Y. Étude de la biologie des sols des forêts tropicales sèches et de leur évolution après défrichement. **[The biology of soils of dry tropical forests and their development after clearing.]** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *E*, 1956 (605–10). 9 refs. [F.f.g.e.]

Soils under dense dry forest showed a more active C metabolism than those under open dry forest. Both were characterized by more active nitrification than dense humid forest. The effect of clearing for cultivation on the biological equilibrium increases with humidity of the environment. Green and artificial manuring and the use of lime and phosphate to reduce the acidification following clearing are necessary.

1246. VIZIR, A. P. **Influence of deciduous [broadleaved] trees on the intensity of ammonification in forest soils.** *Dopovidi Akademii Nauk Ukr. R.S.R.* 1956 (2), (181–4). [Ukr.russ.] From *abstr.* in *Chem. Abstr.* 50 (18), 1956 (13347). P.R.

Intense ammonification was observed in soil when *Sambucus nigra* and *Caragana arborescens* leaves were added. Addition of leaves caused a change from non-spore and pigment-forming bacteria in the first period to bacilli in the second.

1247. STALLINGS, J. H. **Soil-produced antibiotics —plant disease and insect control.** *Repr.* from *Bacteriological Reviews* [*Baltimore*] 18 (2), 1954 (131–46). 107 refs.

A review of literature.

1248. **[Characteristic soil fauna of different types of woodland.]** *Rep. Nat. Conserv., Lond. 1955/56*, 1956 (11).

A statistical procedure, developed on the basis of the number of species of soil fauna common to different sites, has been used to investigate the composition of the soil fauna in relation to different kinds of woodland in the Lake District. Oak woods were found to have a higher % of species in common with each other than they had in common with other types of woodland, and the faunas under Hazel, Sycamore Maple, and Birch were similarly distinct. Faunas under Pine, Yew, Larch, and Spruce lacked this relative uniformity, and conifer woods considered as one group showed much less uniformity than did broadleaved woods considered as one group. This suggests that a characteristic fauna has developed in association with the native broadleaved woodlands, whereas the coniferous woodlands, many of them plantations of exotic species, have as yet only the general woodland fauna.

1249. GABBUTT, P. D. **The spiders of an Oak wood in South-east Devon.** *Ent. mon. Mag.* 92 (1109), 1956 (351–8). 8 refs.

Gives total numbers of 58 species collected by Tullgren funnels from the F and H litter layers in two woods, with graphs of seasonal abundance, data on densities/acre and biological notes.

1250. JAHN, E. Auswirkungen von Waldbränden mit spezieller Berücksichtigung der Veränderungen im Boden und des Bodentierlebens. **[The effects of forest fires, particularly soil and soil-fauna changes.]** *Repr.* from *Natur und Land, Wien* 41 (10/12), [1955] (149–51). 3 refs. [G.]

Discusses, chiefly on the basis of observations on a burnt site in the Stubai mountains (Tyrol), the partial or complete destruction of litter and organic humus substances, and the enrichment of the soil with lime and ash, resulting in an increased pH of the surface layers, reversing the normal pH gradient, e.g. in rendzinas. The destruction of the humus layers, bringing the loose soil of lower layers to the surface,

increases the danger of erosion. On all sites investigated the soil fauna was greatly diminished (and in hot weather totally destroyed) and these effects were long lasting in burnt Spruce and Mountain Pine stands. All these circumstances adversely affect the conditions for plant growth, making reforestation difficult or even impossible.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 1619, 1621 *et seq.*, 1725.

1251. Boggess, W. R. **Amount of throughfall and stemflow in a Shortleaf Pine plantation as related to rainfall in the open.** *Repr.* from *Transactions, Illinois Academy of Science* [*Springfield, Ill.*] 48, 1956 (55–61). 3 refs.

Measurements in 1951–54 in a plantation established in 1937 showed linear relationships of rainfall in the open to that reaching the ground via crown (throughfall) and stem (stem flow) and the net rainfall. The calculated interception by the canopy was 7·5, 9·5 and 10·5% of total rainfall in the open in 1951–52, 1952–53 and 1953–54 respectively. The amount of stem flow per storm for Loblolly Pine [see *F.A.* 14 No. 3004] was found to be about twice that for Shortleaf.

1252. Oberlander, G. T. **Summer fog precipitation of the San Francisco peninsula.** *Ecology* 37 (4), 1956 (851–2). 3 refs.

Gauges were placed under 5 trees (height indicated in brackets) from 20 July to 28 Aug., during which time there was no rain, and the following precipitation (in inches) was measured: *Sequoia sempervirens* (200 ft.) 1·8, *Lithocarpus densiflorus* (20 ft.) 58·8, *Pseudotsuga taxifolia* (125 ft.) 7·2, 8·9, 17·1 varying with exposure. The very high figure for *L. densiflorus* represents a higher precipitation in little more than a month than that found for the whole area in the rainy season.

1253. Hoeve, J. ter, and Roos, P. Grondwater en bos op Terschelling. **[Forests and the water table on Terschelling.]** *Ned. Boschb.-Tijdschr.* 28 (10), 1956 (235–42). 6 refs. [Du.du.e.]

Continuous readings for 1938–55 in planted and unplanted dunes, plus some earlier observations, show that planting caused a drop in the water table, the drop being most rapid in the early years of a stand. Results are shown in graphs.

1254. Thirgood, J. V. **[Effect of *Eucalyptus rostrata* on groundwater.]** *Rep. For. Dep. Cyprus 1955*, 1956 (63).

Excavations were made in a *E. rostrata* stand on a drained swamp. Free water was found at a depth of 14 ft. No taproot formation was found, and no roots $> \frac{1}{8}$ in. in diam. were observed further down than 4 ft. from the surface. There was no evidence that the main horizontal root system sent down any large sinker roots. Only very rare fine hair roots on occasion reached the water surface.

1255. Sato, T., *et al.* **[Some measurements by a new type of mountain infiltrometer. (1).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 83, 1956 (39–64 + 36 photos). 18 refs. [Jap.jap.e.*e.*]

Describes a new portable infiltrometer, incorporating an artificial rainmaker and a bottomless pan (driven into the soil) with a run-off collector at one end. Infiltration data are given for representative forest sites (slopes 20–40°) which are minutely described, with 18 profile diagrams, soil analyses, stand descriptions etc. Readings are fairly close to those of Musgrave's tube type. Data, including data on the effect of litter removal, are tabulated.

1256. Hempel, L. Die Bedeutung der Streudecke für die Bodenabspülung auf Sandsteinböden unter Wald. **[The importance of the litter cover in relation to soil erosion on sandstone soils under forest.]** *Z. PflErnähr. Düng.* 74 (2), 1956 (139–43). 8 refs. [G.] O.R.S.

A number of Spruce and hardwood stands on Keuper sandstone in the Lippe Land were examined. With the exception of a 30-year stand on a site previously carrying hardwoods, all Spruce stands showed signs of erosion on steep slopes. There was no erosion in hardwood stands.

1257. Arghiriade, C., and Abagiu, P. Contribuţii la studiul scurgerilor de suprafaţă în diferite condiţii de relief, sol şi vegetaţie în R.P.R. **[Surface run-off in different conditions of relief, soil, and vegetation in Rumania.]** *Rev. Pădurilor* 70 (9), 1955 (383–95). 9 refs. [Rum.]

Describes and discusses studies begun in 1951 to measure run-off in forest of different densities, on grazed and ungrazed pasture, arable fields, and bare ground. The following conclusions are reached: (1) the accumulation of snow is greater, and snowmelt slower, in Beech woods than in open fields; (2) interception of rainfall in Beech woods varies with % crown cover: 0·9–1·0, 29·6%; 0·8, 22·9%; 0·7 (in an opening) 6·9%; (3) normal forest, with crown cover 0·8 and a litter layer, regulates run-off, prevents soil erosion and ensures constant streamflow. The ill results of litter removal, clear felling on steep slopes, over-grazing, ploughing across the contours etc. are discussed.

1258. **[A study of 1954 flood, in the Shikoku, Kyushu and Yamanashi and Shizuoka districts [of Honshu].]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 84, 1956 (1–139 + 191 photos). 36 refs. [Jap.jap. e.*e.*]

Eight articles (by *S. Takeda, et al.*) cover similar ground to that noted [see *F.A.* 16 No. 2626] in a general reconnaissance of the effects of typhoons Nos. 5, 12, 13 and 14 of 1954. Countermeasures in protective works, suitable silvicultural measures, reclothing landslides etc., are suggested for a proposed erosion control plan. There are detailed topographic maps (1/50,000–1/200,000) and 191 photographs.

1259. Alviella, G. d'. Le littoral belge et la réserve créée par le Gouvernement à Westhoek. **[The Belgian coast and the reserve created by the Government at Westhoek.]** *Bull. Soc. for. Belg.* 63 (12), 1956 (497–519 + 1 photo). 4 refs. [F.]

Gives some account of the coastal dunes, the

history of their afforestation, and their present vegetation, discusses the formation of the reserve, and raises questions in relation to its management.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 1832 *et seq.*, 2231 *et seq.*

1260. SCHMUTTERER, H. Zur Lachnidenfauna Bayerns (*Homoptera: Aphidoidea: Lachnidae*). **[Lachnids of Bavaria.]** *Nachrichtenblatt der Bayerischen Entomologen, München* 2 (11; 12), 1953 (86–7; 92–4); 3 (1), 1954 (3–4). 12 refs. [G.g.] L.E.

Describes 26 species found mostly on conifers, but also on some broadleaved trees. All species observed, except those of the genera *Protolachnus*, *Schizolachnus* and *Lachniella*, were visited by ants.

1261. MATHUR, R. N. **Immature stages of Indian Coleoptera (27) *Gibbium psyllioides* Czempinski (family: Ptinidae).** *Indian For.* 82 (10), 1956 (511–3 + 1 plate). 6 refs.

1262. MARSHALL, G. A. K. **New African Cossoninae (Col. Curculionidae).** *Ent. mon. Mag.* 92 (1106), 1956 (279–81).

Contains descriptions of *Procossonus gardneri* from logs of *Khaya anthotheca*, *Hopliturus octodentatus* from *Acacia mollissima*, *Stenoscelis podocarpi* from *Podocarpus* and *Cupressus*, *S. widdringtoniae* from *Widdringtonia*, and *S. pittospori* from *Pittosporum*, the last from Somaliland, the rest from E. Africa.

1263. WOOD, S. L. **New species of bark beetles (Coleoptera: Scolytidae), mostly Mexican. Part III.** *Canad. Ent.* 88 (6), 1956 (247–58). O.R.S. [Cf. *F.A.* 18 No. 65.]

1264. NUORTEVA, M. Fennoskandialle uusi kaarnakuoriaislaji *Ips amitinus* Eichh. tavattu Suomesta. **[*I. amitinus*, new for Scandinavia.]** *Repr.* from *Annales Entomologici Fennici, Helsinki* 21 (1), 1955 (30–2). 11 refs. [Fi.g.*g*.]

A specimen was found in 1954 in Vuoliniemi, S. Finland. No specimens had previously been reported from farther N. than Estland, but one specimen, found at the island of Långskär (S. Finland) was discovered in the Helsinki Museum under another name.

1265. THALENHORST, W. Zur Kenntnis der Temperatur-Entwicklungs-Relation der kleinen Fichtenblattwespe *Pristiphora abietina* Christ. **[The development of *P. abietina* in relation to temperature.]** *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes, Braunschweig* 7 (12), 1955 (199–201). 4 refs. [G.] I.I.E.

Reports laboratory experiments on the time taken from oviposition to pupation of ♀ larvae (including intermediate stages) at temperatures ranging from 8° to 30° C., and discusses the literature. Gäbler's period of 21 days at 18–21° C. is considered to be too long.

1266. WONG, H. R. **Preliminary notes on intersexes and gynandromorphs of the Larch sawfly.** *Canad. Ent.* 88 (9), 1956 (545). O.R.S.

1267. GONÇALVES, C. R. Nota suplementar sobre as saúvas do nordeste do Brasil. **[The leaf-cutter ants [*Atta* spp.] of north-eastern Brazil.]** *Boletim fitossanitário, Rio de Janeiro* 6 (1/2), 1952/5 (21–6). 1 ref. [Port.] I.I.E.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 1588, 1818 *et seq.*

1268. MUNROE, E. **Canada as an environment for insect life.** *Canad. Ent.* 88 (7), 1956 (372–476 + 3 maps). Many refs. O.R.S.

Gives a brief geographical account of the main environmental factors (climate, soil, vegetation etc.), a short outline of the possible history of the fauna, examples of the main distributional types and a tentative classification of entomological regions, with notes on some characteristic insects of each.

1269. SOUTHERN, H. N. **Myxomatosis and the balance of nature.** *Quart. J. For.* 50 (4), 1956 (303–7).

A talk broadcast on the BBC Third Programme, describing some of the effects of the disappearance of the rabbit population from a 1000-acre deciduous wood on the balance of population of owls, foxes, and small rodents.

1270. SAINIO, P. Hirven talvisesta ravinnosta. **[On the feeding of elk in winter.]** *Silva Fenn.* 88 (1), 1956. pp. 24. 6 refs. [Fi.sw.e.]

In Finland the principal winter food of the elk was found to be Willow (70–90%). Other species eaten, in descending order of preference, are Aspen, Scots Pine, Mountain Ash, Juniper and Birch.

1271. ROSEVEAR, D. R. **A forester looks at game preservation.** *Malay. Forester* 19 (4), 1956 (185–93).

Criticizes current practice in the matter of wildlife preservation, particularly in Africa, and suggests the combination of game and forest reserves.

16. General Botany

160. Plant Chemistry

See also Nos. 1233–4, 1243, 1247, 1286–92, 1325, 1596–7, 1741–3, 1804, 2288 *et seq.*

1272. GRÜMMER, G. Die gegenseitige Beeinflussung höherer Pflanzen—Allelopathie. **[The interactions between higher plants—allelopathy.]** Gustav Fischer Verlag, Jena. 1955. pp. 162. Many refs. [G.] Price *DM*.12.

A review of chemical influences, starting from the work of H. Molisch with ethylene. Main chapters are: ethylene; other gaseous emanations; other excretions of leaves; root excretions; the importance of excreted substances (cholines) for forestry and agriculture; semi-parasites and parasites and their hosts; and the mutual influence of pollen. There are 16 pages of references including many Russian, and a discussion of terminology.

1273. LAGRANGE, E. L'action antibiotique de *Juglans regia* L. **[The antibiotic action of *J. regia*.]** *C.R. Soc. Biol., Paris* 150 (3), 1956 (613–5). 2 refs. [F.] O.R.S.

There appear to be 4 active principles in fresh leaves, one bactericidal and 3 inhibiting the growth of *Bacillus* spp. The first is found in the leaves from the beginning of the season until mid-August, and the other 3 until later in the season.

1274. LEWIS, Y. S., and JOHAR, D. S. **Characterization of the pigment in Red Tamarind (*Tamarindus indica* Linn.).** *Curr. Sci.* 25 (10), 1956 (325–6). 8 refs. A.P.B.

Physical and chemical properties of a red pigment from a variety with red 'berries' [pulpy seed?] and a red pigment obtained by boiling green Tamarind 'berries' with dilute HCl.

1275. MANSFORD, K., and RAPER, R. **The free and combined aminoacids in some plant juices.** *Ann. Bot.* 20 (78), 1956 (287–95). 27 refs. O.R.E.

Describes the experimental techniques, particularly paper chromatography, used in the analysis of 6 plant juices, including *Pinus sylvestris* and *Pyrus malus*, and tabulates amino-acids present in 75% alcohol extracts and in hydrolysates of alcohol-insoluble fractions, and also expresses these components in % of those contained in *Equisetum arvense*, measured at fortnightly intervals.

1276. LUBLINER-MIANOWSKA, K. Badania składu chemicznego pyłku. 1. Badania pyłku jako pokarmu pszczół. **[The chemical composition of pollen. 1. The study of pollen as bee-food.]** *Acta Soc. Bot. Polon.* 25 (3), 1956 (409–19). 37 refs. [Pol.pol.e.*e.*] O.B.D.

Presents the results of analyses of pollen of 17 species for contents of water, ash, crude protein, ether-extract and reducing and non-reducing sugars, and of 13 species for crude protein content only. Many woody species are included.

1277. SPADA, A., and CAMERONI, R. Sui pigmenti flavonici del polline di *Acacia dealbata*. Nota IV. **[The flavone pigments of the pollen of *A. dealbata*. IV.]** *Gazzetta Chimica Italiana, Roma* 85 (9/10), 1955 (1043–9). 11 refs. [It.] L.S.

In addition to naringenin, the writers have isolated its two glucosides and a third glucoside which, on hydrolysis, yielded glucose, rhamnose and a flavanol (isomer of quercetin).

161. Physiology

See also Nos. 1272, 1365 *et seq.*, 1431, 1515, 1517, 1554–5, 1644, 1745, 1778, 2069–70, 2073, 2091.

1278. RUHLAND, W., *et al.* [Editors]. Handbuch der Pflanzenphysiologie. Band III. Pflanze und Wasser. **[Encyclopedia of plant physiology. Vol. III. Water relations of plants.]** Springer-Verlag, Berlin. 1956. pp. xx + 1073. Many refs. [G., E. or F.] Price *DM.* 248.

The volume is divided into the following main parts: basic facts of cell physiology; water uptake and storage; water losses; water conduction; static and dynamic water relations; and the water regime of ecological types. It contains contributions from many authors, mostly in German, some in English and 1 in French. There are German and English subject indexes.

1279. STONE, E. C., SHACHORI, A. Y., and STANLEY, R. G. **Water absorption by needles of Ponderosa Pine seedlings and its internal redistribution.** *Plant Physiol.* 31 (2), 1956 (120–6). 62 refs. O.R.E.

When the tops of 2-year-old seedlings were exposed to a continuous mist-spray after their roots had been sealed either into empty flasks or tins of soil dried to sunflower wilting-point, water moved back through the plant and out at the roots only if the temperature was allowed to fluctuate, suggesting that this movement is the result of a vapour-pressure gradient and not of forces within the plants. [Cf. *F.A.* 17 No. 1327.]

1280. SUTCLIFFE, J. F. **Salt uptake in plants.** *Nature, Lond.* 178 (4539), 1956 (897–9).

Summarizes a session of the Botany section of the British Association at Sheffield, 1956, including a paper on 'Factors affecting salt uptake by Beech roots' (*J. L. Harley*).

1281. FERRELL, W. K., and JOHNSON, F. D. **Mobility of calcium-45 after injection into Western White Pine.** *Science* 124 (3217), 1956 (364–5). 3 refs. O.R.S.

Tabulated data, from work over 4 years on trees from 4 different areas, indicate a substantial movement of previously deposited Ca^{45} into newly developed buds.

1282. WIKBERG, E. **The distribution of water-soluble radioactive substances in plant tissue—some experiments with an autoradiographic method.** *Skr. K. Skogshögsk., Stockh.* No. 24, 1956. pp. 11. 9 refs. [E.e.]

In shoots of young plants of *Pinus sylvestris* that had absorbed P^{32} through the roots, the larger accumulations were in meristematic tissue in the needles, in buds and bud traces, and in phloem and cambium. The concentration was lower in the xylem and lowest in the cortex. Accumulations of S^{35} in roots of *Vicia faba* in different stages of development were also determined. Results are illustrated in autoradiograms.

1283. KUNTZ, J. E., and RIKER, A. J. **The use of radio-active isotopes to ascertain the role of root grafting in the translocation of water, nutrients, and disease-inducing organisms among forest trees.** *Proceedings of the International Conference on the Peaceful Uses of Atomic Energy, Geneva, 1955* Vol. 12, 1956 (144–8). 6 refs. L.S.

Describes chiefly work on *Quercus ellipsoidalis* and *Q. macrocarpa* dealing with speed and variations (seasonal, interspecific, etc.) of sap-stream movements and the linking of trees through root grafts, particularly in *Q. ellipsoidalis*, and on Oak wilt research in which fungus spores were made radio-active.

1284. HELLMERS, H., and MACHLIS, L. **Exogenous substrate utilization and fermentation by the**

pollen of *Pinus ponderosa*. *Plant Physiol.* 31 (4), 1956 (284–9). 22 refs. O.R.E.

Describes experiments which show that the pollen can absorb a variety of mono-, di- and trisaccharide sugars which are synthesized into polysaccharides and respired, and that it can ferment and utilize endogenous sucrose, being endowed with the necessary enzymes for anaerobic existence. These capacities are discussed in relation to the life history of the pollen *in situ*. *From authors' summary.*

1285. CLARK, J. **Photosynthesis of White Spruce and Balsam Fir.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (1–2).

In connexion with work on the effects of budworm defoliation, measurements were made of photosynthesis in Balsam Fir foliage of different ages. Twigs from the same 4 trees were used throughout the season. Results show that, in all but the 'new' needles, the photosynthetic rate was fairly constant for any one age-class from May to October, the rate decreasing with age. Under the experimental conditions, 1-year-old needles had a photosynthetic capacity ca. twice that of 6-year-old needles. On the other hand, the capacity of 'new' (current year's) foliage increased as the young shoots and needles developed and up to mid-June respired more CO_2 than they assimilated, thus temporarily draining energy from the tree. This deficit must be made up from existing food reserves in the tree or from the photosynthetic activity of older needles. About 15 June the current needles accounted for no net loss or gain of C; in late August their CO_2 assimilation equalled that of the 1-year-old needles; and only in late September did they attain maximum photosynthetic capacity. Comparable measurements on White Spruce followed a similar seasonal pattern but showed a wider spread between needle age-classes, e.g. 1-year-old needles had a photosynthetic capacity slightly > 3 times that of 6-year-old needles. It is generally accepted that the new foliage is of greatest value to the tree. This is true in the sense that it will form the most important photosynthetic component in the following year, but the immediate effects of defoliation of new needles in June will be less than the effects of loss of an equal volume of 1-year-old needles. In fact, before mid-June the tree might benefit temporarily from loss of new needles. These findings are being related to total volumes of needles of different age-classes on young and mature trees.

1286. WOLF, F. T. **Changes in chlorophyll *a* and *b* in autumn leaves.** *Abstr.* in *Plant Physiol.* 31 (Suppl.), 1956 (xxx). O.R.E.

A decrease in the % of chlorophyll *a* was noted in comparisons of green and yellow leaves of each of the 25 tree species tested.

1287. GUNDERSEN, K., and FRIIS, J. Chlorophyll i marv og ved hos løvfældende træer. [**Chlorophyll in pith and xylem of deciduous trees.**] *Bot. Tidsskr.* 53 (1), 1956 (60–6). 10 refs. [Dan.e.] O.B.D.

Young twigs of all species examined contained chlorophyll in the pith and the medullary rays, in cells rich in starch. The results of investigations on 11 species are presented.

1288. SIMINOVITCH, D., CHATER, A. P. J., and SWANN, I. **Seasonal variations in the rate of incorporation of amino-acids into the proteins of the cells of the bark of the Black Locust tree in relation to the seasonal variation in its protein and frost hardiness.** *Abstr.* in *Plant Physiol.* 31 (Suppl.), 1956 (viii). O.R.E.

In a laboratory study using radioactive glycine and excised bark tissue, periods of marked increase in this rate corresponded to periods of maximum variation in both hardiness and protein concentration. The sudden onset of these changes in response to some internal or external factor suggests some type of trigger mechanism. [Cf. *F.A.* 15 No. 87.]

1289. PLAISTED, P. H. **Changes in the free amino-acids that accompany ageing in leaves of *Acer platanoides*.** *Abstr.* in *Plant Physiol.* 31 (Suppl.), 1956 (viii). O.R.E.

Describes the quantitative changes in the composition of the alcohol-soluble fraction through the entire life of the leaf.

1290. BOLLARD, E. G. **Nitrogenous compounds in plant xylem sap.** *Nature, Lond.* 178 (4543), 1956 (1189–90). 9 refs.

The predominance of organic nitrogenous compounds in tracheal sap of Apple trees [cf. *F.A.* 14 No. 3036] implies that incoming inorganic N is largely converted into organic form in the root system. The transpiration stream then carries to the shoot a mixture of amino-acids and amides, among which aspartic acid, asparagine and glutamine are quantitatively the most important. That these phenomena are not peculiar to Apples has been shown by chromatographic examination of xylem sap extracted from shoots of a range of dicotyledons, monocotyledons, and gymnosperms. Nitrate was present in saps of fewer than half the species tested, and usually only in trace amounts. In all cases, whether nitrate was detectable or not, a range of organic nitrogenous compounds was present. With most species either asparagine or glutamine was quantitatively the most important individual compound. Citrulline, not previously widely recorded in plants, was present in xylem sap from species of 29 families, being of importance in a number of species in the genera *Juglans*, *Alnus*, *Nothofagus*, *Annora* [?*Annona*], *Persea*, *Diospyros* and *Chamaecyparis*; it was not found in any monocotyledon. Allantoin and/or allantoic acid was present in xylem sap from members of 23 families and was a major constituent of it in some species of the genera *Persea*, *Acer* and *Aesculus*. Neither of these compounds was detected in any gymnosperm and they occurred in only one monocotyledon (*Arundinaria*).

1291. MACLEOD, D. M., and LOUGHEED, T. C. **Utilization of carbohydrates by a *Hirsutella* sp. from *Choristoneura fumiferana*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (2).

In order to obtain information on the growth requirements of entomogenous fungi, studies were made of *Hirsutella* sp. isolated from *C. fumiferana* and grown in submerged (shake) cultures on various

synthetic media. The experiments showed that this fungus can utilize a wide assortment of carbohydrates as a source of C, and the limiting factor in its growth is evidently not its source of C.

1292. KAZARJAN, V. O., and AVUNDŽJAN, È. S. Fermentativnaja aktivnostj listjev raznovozrastnyh derevjev i ee izmenenie pri vegetativnom razmnoženii rasteniï. **[Leaf enzyme activity in trees of different ages, and change in such activity after vegetative propagation.]** *Dokl. Akad. Nauk SSSR* 108 (5), 1956 (958–61). 15 refs. [Russ.] A.P.B.

In summer 1955, measurements were made by Kursanov's method [no details given] of the invertase activity of normally developed leaves from (*a*) 3- to 4- and (*b*) 70- to 80-year-old *Populus alba* and *Elaeagnus angustifolia*, 3 times in the course of one day. The synthesis/hydrolysis ratio was high for (*a*) and low for (*b*) in both species. Leaves from fruiting shoots of *E. angustifolia* showed much lower ratios than those from vegetative shoots. In 70-year Poplar, hydrolysis exceeded synthesis even during the day. There were larger amounts of reducing and soluble sugars in (*b*) than in (*a*) but the total content of sugars was higher in (*a*). Measurements made on leaves from one-year-old rooted cuttings of *P. alba*, *E. angustifolia* and *Salix alba* showed higher synthesis/hydrolysis ratios than those of leaves on comparable shoots of the old parent trees, and their invertase activity was of the same order as for (*a*).

1293. MARTH, P. C., AUDIA, W. V., and MITCHELL, J. W. **Effect of gibberellic acid on growth and development of various species of plants.** *Abstr.* in *Plant Physiol.* 31 (Suppl.), 1956 (xliii). O.R.E.

Applied as a 1% lanolin paste, this acid greatly increased the growth of many plants, including 1- to 3-year-old Willows, Oaks, Tulip Trees and Maples. White Spruce, and two species of Pine showed only a slight increase in the length of terminal shoots. Effect on time of flowering varied.

1294. FAVRE-DUCHARTRE, M. Contribution à l'étude de la fécondation chez *Cephalotaxus*. **[Study of the fertilization of *Cephalotaxus* [*drupacea*].]** *C.R. Acad. Sci., Paris* 243 (18), 1956 (1349-52). 8 refs. [F.f.] O.R.S.

1295. CLENDENNING, K. A., BROWN, T. E., and WALLDOV, E. E. **Causes of increased and stabilised Hill reaction rates in polyethylene glycol solutions.** *Physiol. Plant., Copenhagen* 9 (4), 1956 (519–32). 18 refs.

Leaf chloroplasts were extracted from 12 species of trees including *Acer saccharum*, *Robinia pseudoacacia* and *Ailanthus altissima*, and from herbaceous and aquatic plants. When extracted in 30% Carbowax 4000, cytoplasm remains with the plastids and the capacity of the chloroplasts for the Hill reaction is stabilized. The initial capacity for water photolysis is higher in Carbowax-cytoplasm when the activity measurements are made under chloroplast-limited conditions. The stabilizing effect of the condensed cytoplasm becomes increasingly evident at high temperatures and after long storage periods.

1296. BUVAT, R. Variations saisonnières du chondriome dans le cambium de *Robinia pseudoacacia*. **[Seasonal variations in the chondriome in the cambium of *R. pseudoacacia*.]** *C.R. Acad. Sci., Paris* 243 (23), 1956 (1908–11). 1 ref. [F.f.] O.R.S.

163. Embryology

See also Nos. 1350, 1389–91.

1297. BRENNAN, M., DOYLE, S. J., and DOYLE, J. **The gametophytes and embryogeny of *Athrotaxis* [*A. selaginoides* and *A. laxifolia*].** *Sci. Proc. R. Dublin Soc.* (*n.s.*) 27 (7), 1956 (193–252 + 4 plates). 42 refs. Price 20*s*. O.R.S.

164. Morphology

See also No. 1431.

1298. WARDLAW, C. W. **Generalizations on the apical meristem.** *Nature, Lond.* 178 (4548), 1956 (1427–9). 28 refs.

Reviews recent literature, including work on *Pinus ponderosa* and other conifers, and criticizes in some detail the theory of phyllotaxis propounded by French botanists.

1299. CODACCIONI, M. Phyllotaxie du châtaignier, étude des cas normaux. **[Phyllotaxy of the Chestnut, a study of normal cases.]** *C.R. Acad. Sci., Paris* 243 (15), 1956 (1056–9). [F.f.] O.R.S.

1300. GOMES, A. M. DE AZEVEDO. Sobre a ontogenia dos ramos compridos e flechas do pinheiro bravo. **[The ontogeny of long shoots of *Pinus pinaster*.]** *An. Inst. Agron., Lisboa* 21, 1954 (137–96 + 2 plates). 28 refs. [Port.] C.G.B.

1301. FÆGRI, K. **Recent trends in palynology.** *Bot. Rev.* 22 (9), 1956 (639–64). 33 refs.

A review of selected literature, with some remarks on incomplete and unpublished investigations, under the heads: textbooks; pollen morphology (exine, columellae, apertures, electron microscopy); nomenclature; pollen analysis (Quaternary and pre-Quarternary); and palynology and taxonomy.

1302. WETTSTEIN, W., and NIKLAS, L. Vergleichende Pollenuntersuchungen an verschiedenen Lärchenrassen. (Vorläufige Mitteilung.) **[Comparative studies of pollen in different Larch provenances. (Preliminary report).]** *Österreichische botanische Zeitschrift, Wien* 102 (4/5), 1955 (520–3). 10 refs. [G.] L.S.

Observations on the dimensions of pollen grains from 47 Larches in Mariabrunn, of 2 different Alpine and 2 different Sudeten provenances. No specific differences based on provenance could be established, though the range of variation was somewhat greater in the Alpine than in the Sudeten provenances.

1303. CAMPO, M. VAN, and ELHAI, H. Étude comparative des pollens de quelques chênes. Application à une tourbière normande. **[Comparative study of the pollen of some Oaks. Application to a peat bog in Normandy.]** *Bull. Soc. bot. France* 103 (5/6), 1956 (254–60 + 2 plates). 6 refs. [F.] O.B.D.

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 1302, 1361, 1386, 1487, 1497–9, 1525, 1745.

1304. **Foresters try for better forests from tree seeds [: a report on nationwide progress in forest genetics].** *Lumberm.* 83 (9; 13), 1956 (72–81; 56–7, 112 . . . 124).

A symposium, summarizing the work of Government, universities, and industry on genetics and provenance trials in N. America.

1305. MAKI, T. E. **The way to better trees.** *For. Fmr.* 16 (3), 1956 (6–7).

Outlines the programme of research in forest genetics being carried out at N. Carolina State College.

1306. HENRY, B. W. **Progress at Institute of Forest Genetics.** *For. Fmr.* 16 (3), 1956 (4–5, 18).

A brief account of the staff, facilities and research programme of the Southern Institute of Forest Genetics at Gulfport, Mississippi.

1307. GATHY, P. Aperçu des recherches en matière de génétique forestière. [**A review of research in forest genetics.**] *Bull. Soc. for. Belg.* 63 (10), 1956 (393–433 + 12 photos). 43 refs. [F.]

Reviews methods and results of genetical research and provenance trials carried out in Belgium since ca. 1900 on *Pinus sylvestris*, *P. nigra*, *Picea abies*, *Larix decidua*, *Pseudotsuga taxifolia*, *Fagus sylvatica*, *Quercus robur* and *Q. sessiliflora*.

1308. BOUVAREL, P. Applications de la génétique forestière à l'épicéa du Jura. [**Applications of forest tree breeding to Spruce in the Jura.**] *Bull. Soc. for. Franche-Comté* 29 (4), 1956 (202–16). [F.]

Gives some account of the important stands of the region, the different ecotypes and climatic races and individual variations, the employment of seed from the Jura in other areas of France and elsewhere, and the experimental breeding being carried out at Les Barres and Nancy.

1309. SCHRÖTTER, F. W., FRHR. VON. Zur Frage der Fichtenauslese und -züchtung in Schleswig-Holstein. [**Selection and breeding of Spruce in Schleswig-Holstein.**] *Z. Forstgenet.* 5 (5/6), 1956 (186–94). 27 refs. [G.g.e.f.]

When surveying and appraising Spruce stands for sources of seed, it was found that Spruce of different provenances could not be distinguished by uniform collective characteristics and therefore no conclusions could be reached as to the formation of individual ecotypes. On the other hand some distinct morphological types were recognizable, viz. '*Fahnentyp*' (banner-type) and '*Fittichtyp*' ('wing' type); between these two is a third type. The 'wing' type seems to be characterized by shade tolerance, good stem form and slender branches. Breeding experiments are planned. *From author's summary.*

1310. KIELLANDER, C. L. Über eine spättreibende Rasse von *Picea abies* in Schweden und eine Schwierigkeit bei der Plusbaumauswahl. [**A late-flushing provenance of *P. abies* in Sweden and a difficulty in the selection of plus trees.**] *Z. Forstgenet.* 5 (5/6), 1956 (181–5). 13 refs. [G.g.e.f.]

Discusses the progeny of individuals in a stand of *P. abies* in S. Sweden that probably represents a provenance from the lowlands of N. Germany. After artificial pollination a mother tree has transmitted to all its progeny genes for very late flushing and consequent resistance to spring frosts. Time of flushing is very little influenced by environment and is thus well suited for genetic investigation. The ability of mother trees to transmit growth capacities to their progeny is discussed, the author concluding that rate of growth is due to environmental factors to a much wider extent than hitherto supposed. Growth-promoting and growth-retarding factors particularly affecting Norway Spruce are reviewed, in particular ground-water and root competition; on forest soils the influence of hereditary factors is likely to be outweighed by a number of environmental factors. With Norway Spruce, therefore, it is necessary to work with an unusually large number of plus phenotypes in order to ensure that genetical plus trees are included among them. *From author's summary.*

1311. STOECKELER, J. H., and RUDOLF, P. O. **Winter coloration and growth of Jack Pine in the nursery as affected by seed source.** *Z. Forstgenet.* 5 (5/6), 1956 (161–5). 4 refs. [E.e.f.g.]

Observations in a Wisconsin nursery on Jack Pine of 29 different provenances revealed that autumn foliage colour changes are associated with the latitude of the seed source. The more northerly the seed source, the more purplish are the needles in cold weather. Colour changes earliest, and is most intense and complete, in 1 + 0 stock. It changes progressively less in 2 + 0 and 3 + 0 stock and is least in 2 + 1 stock. Colour change was also correlated with the average January temperature of the original seed source, but the correlation with latitude proved closer. Height growth of 2 + 0 stock proved to be positively correlated with the latitude of the seed source and with temperatures in the original area of seed collection. *From authors' summary.*

1312. **Report of the conference on White Pine [*Pinus strobus*] tree improvement April 24, 1956, Concord N.H.** New Hampshire Forestry and Recreation Commission, Concord, N.H. 1956. pp. 29.

An edited transcription of a tape-recording of the discussion, including papers on the breeding of blister-rust-resistant strains (*R. Hirt; C. C. Heimburger; E. J. Schreiner*), summarizing work carried out by Syracuse College of Forestry, the Ontario Dept. of Lands and Forests, and the Northeastern Forest Experiment Station.

1313. HENRY, B. W., and BERCAW, T. E. **Shortleaf-Loblolly hybrid Pines free of fusiform rust after 5 years' exposure.** *J. For.* 54 (11), 1956 (779).

F_1 seedlings of *P. taeda* × *P. echinata* were planted out in 1951 in Louisiana. In 1955 and 1956 the 31 surviving hybrids showed no sign of *Cronartium fusiforme*. Of near-by seedlings, 65 out of 97 *P.*

elliottii and 3 out of 3 *P. taeda*, were found to have fusiform cankers.

1314. SØEGAARD, B. **Leaf blight resistance in *Thuja*. Experiments on resistance to attack by *Didymascella thujina* (Dur.) Maire (*Keithia thujina*) on *Thuja plicata* Lamb.** *Årsskr. Vet. Landbohøjsk.* 1956 (30–48). 3 refs. [E.]

[Cf. *F.A.* 16 No. 628.] In controlled and open pollination experiments at Hørsholm Arboretum, progeny of *T. plicata* exposed to natural infection were attacked though individual resistance varied, those of *T. standishii* and the F_1 hybrid of the two species were resistant, while the back-cross to *T. plicata* showed an equal segregation of diseased and healthy plants. Cuttings of *T. plicata*, representing the adult stage of the tree, were almost entirely resistant to both natural and artificial infection, while seedlings from the same tree were severely attacked. A graft (the only one surviving into 1955 of up to 20 per tree made in 1951 on infected trees of a 25-year stand of *T. plicata*) was free of disease although the tree and branch were severely attacked. Methods of obtaining hybrids by controlled pollination and of rooting cuttings are described.

1315. EIFLER, I. Artkreuzungen bei Birken. **[Species hybrids of Birch.]** *Züchter* 26 (11), 1956 (342–6). 15 refs. [G.g.] E.M.B.

A fuller account of research already reported. [See *F.A.* 18 No. 118.]

1316. KRAHL-URBAN, J. Forstgenetik in der Eichen- und Buchenwirtschaft. **[Forest genetics in Oak and Beech management.]** *Forstarchiv* 26 (6), 1955 (121–31). 59 refs. [G.]

Summarizes the present state of knowledge of the genetics of Oak and Beech with reference to individual tree characters, and offers the following practical conclusions for management: (1) In selecting genetically valuable trees or stands, site factors and stand characteristics should be considered, with particular reference to early or late flushing and leaf-fall. Districts in Germany producing valuable Oak and Beech strains are listed. (2) Where natural regeneration from inferior stands is financially necessary, regeneration should be as dense as possible to prevent e.g. forking; there is no known measure against spiral grain. (3) In artificial regeneration only the best provenances should be used. An attempt should be made to find plus trees in every established or supposed ecotype: a minimum of 6–8 plus trees should be selected to avoid inbreeding, though, if mast years are infrequent, regeneration may be held up by this method. (4) In regenerating from inferior strains, an admixture of valuable provenances is advisable, with a minimum in plantings of 300–400 Oak and 500–800 Beech [per ha.] and, in direct sowings, of 10% of seed. Improvement of regeneration by grafting in the field is safe but expensive.

1317. LĂZĂRESCU, C. Un stejar roşu hibrid apărut in cultură. **[A hybrid Red Oak.]** *Rev. Pădurilor* 70 (8), 1955 (317–20). 4 refs. [Rum.rum. russ.]

Describes apparently hybrid seedlings occurring in sowings of *Quercus imbricaria*. The parent tree grew in close proximity to a group of other exotic Oaks—*Q. rubra*, *Q. coccinea* and *Q. velutina*—and the hybrids are presumably the result of cross-pollination by one of these.

1318. DUMITRIU-TĂTĂRANU, I. Noutăti dendrologice în flora Dobrogei, × *Quercus getica* Movariu şi × *Quercus budensis* Borb. **[Dendrological novelties in the flora of the Dobrudja: × *Q. getica* and × *Q. budensis*.]** *Rev. Pădurilor* 71 (3), 1956 (180). 4 refs. [Rum.]

Describes two natural hybrids, × *Q. getica* (*Q. pedunculiflora* × *Q. frainetto*) and *Q. budensis* (*Q. pubescens* × *Q. virgiliana*).

1319. JOHNSSON, H. Heterosiserscheinungen bei Hybriden zwischen Breitengradrassen von *Populus tremula*. **[Heterosis in *P. tremula* hybrids from parents of different latitudinal provenances.]** *Z. Forstgenet.* 5 (5/6), 1956 (156–60). 5 refs. [G.g.e.f.]

Trials over 10 years with 6 *P. tremula* provenances from 6 different latitudes ranging from 56° to 60° N. in Sweden confirm that northern strains show decreased growth when raised in more southerly latitudes. This latitudinal variation appears to be clinal. The correlation between origin and growth can be roughly expressed by the equation

$$z = (100 - k_1) \times d^{k_2},$$

where z = height increment of a population compared with that of the same provenance growing in its place of origin, and d = the difference in degrees of latitude between the place of origin and the place of cultivation, $k_1 = -0{\cdot}0535$ and $k_2 = 2{\cdot}0515$. In the same experiment, trials were made of 6 hybrids with parents from varying latitudes. The growth of 5 of these was superior to the average growth of the parents when raised in the same latitude as the hybrids. The author concludes that, in the hybrids, the negative effect of moving the parents southward from their original latitude is counterbalanced by the effects of hybrid vigour. *From author's summary.*

1320. PRYOR, L. D. **An F_1 hybrid between *Eucalyptus pulverulenta* and *E. caesia*.** *Proc. Linn. Soc. N.S.W.* 81 (2), 1956 (97–100). 3 refs. D.S.I.R.

A viable F_1 hybrid between these two species has been produced by manipulated pollination. It is suggested that *E. caesia* belongs to a natural systematic group with bisected cotyledons and that successful hybridization between this group and many species of the *Macrantherae-Normales* may be possible. *From author's summary.*

1321. PRYOR, L. D. **The identity of *Eucalyptus subviridis* Maiden and Blakely.** *Proc. Linn. Soc. N.S.W.* 81 (2), 1956 (101–4). D.S.I.R.

E. subviridis was first considered a hybrid between *E. cinerea* and *E. blakelyi* because of its field occurrence and the segregation of juvenile characters in seedlings raised from it. It has also been formed by artificial crossing. The F_1 is intermediate between the two parents in many of its characters and grows as quickly as the slower-growing parent, *E. blakelyi*. Segregates that are nearly intermediate in morphology between the two parents are of lower

viability than those that approach either parent. It follows that ecological sorting, if environmental conditions remain unchanged, would lead to the separate maintenance of the two species in the field even though they grow at times side by side and successfully hybridize. *From author's summary.*

1322. ROY, R. P., and JHA, R. P. **Cytological studies in *Shorea robusta* Roxb.** *Sci. & Cult.* 22 (4), 1956 (236–8). 2 refs. E.M.B.

The somatic count shows $2n = 14$. A table gives the dimensions of the long, medium and small chromosomes. No cytological differences were established between the red and white varieties.

168. Histology

See also section 811.

1323. GUTTENBERG, H. VON. Histogenetische Studien an *Cupressus sempervirens* L. und *Casuarina distyla* Vent. [**Histogenetic studies on *C. sempervirens* and *C. distyla*.**] *Österreichische botanische Zeitschrift, Wien* 102 (4/5), 1955 (420–35). 17 refs. [G.] L.S.

1324. REINERT, J. **Dissociation of cultures from *Picea glauca* into small tissue fragments and single cells.** *Science* 123 (3194), 1956 (457–8). 10 refs. O.R.S.

During experiments on the cultivation of *P. glauca* tissues *in vitro*, strains were isolated in which normal tissue, after the omission from the nutrient of vitamin B_{12} and folic acid, showed a marked tendency to dissociate spontaneously and continued to grow with undiminished vigour and without necrosis or other evidence of injury. Possible causes are discussed. [Cf. *F.A.* 17 No. 3657.]

1325. REZNIK, H., and URBAN, R. Die Aufnahme ^{14}C-markierter Ligninbausteine in Fichtennadeln. [**The uptake of C^{14}-labelled structural elements of lignin in Spruce needles.**] *Planta* 47 (1), 1956 (1–15). 12 refs. [G.g.] O.B.D.

Some preliminary results of tests to investigate the behaviour of different tissues in Spruce needles after the application of labelled structural elements of lignin to the decapitated tips of side shoots.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 1291, 1781 *et seq.*, 2219 *et seq.*

1326. PETRAK, F., and AHMAD, S. Beiträge zur Pilzflora Pakistans. [**Contributions to the fungus flora of Pakistan.**] *Sydowia, Annales Mycologici Ser. II, Horn* 8 (1/6), 1954 (162–85). [G.] I.M.I.

Includes *Acanthostigma lahorense* sp. nov. on rotten wood; *Cucurbitaria pakistanica* sp. nov. on *Acacia modesta*; *Xylosphaeria ahmadii* sp. nov., on rotten wood, *Dalbergia sissoo*, and *Zizyphus jujuba*; *Lophodermium pini-excelsae* sp. nov. on *Pinus excelsa*; *Botryodiplodia deodarae* sp. nov. on *Cedrus deodara*; *B. mangiferae* comb. nov. on *Mangifera indica*; *B. meliae* sp. nov. on *Melia azedarach*; *Coleophoma mangiferae* and *Dothiorella ladharensis* on *Mangifera indica*; *Haplosporella prosopidina* sp. nov., and *H. prosopidincola*, sp. nov., on *Prosopis juliflora*; *Leptostroma ahmadii* sp. nov. on *Pinus excelsa*; and *Hendersonia leptostromatis* sp. nov. on *L. ahmadii*.

1327. GREMMEN, J. **Some additional notes on *Crumenula* de Not. and *Scleroderris* (Fr.) de Not.** *Sydowia, Annales Mycologici Ser. II, Horn* 9 (1/6), 1955 (231–2). 5 refs. [E.] L.S.

Distinguishes *Atropellis piniphilum* and *Crumenula sororia*, giving main hosts for each; identifies the fungus described as *C. laricionis* Unam. (on *Pinus nigra* in Spain) with *Cenangium acicolum*; and proposes to alter the name of *Scleroderris abietina* (Lgbg.) Gremmen to *S. lagerbergii*. [Cf. *F.A.* 15 No. 1122.]

1328. WILSON, C. L. **Development of the ascogonium and perithecium of *Endoconidiophora fagacearum*.** *Phytopathology* 46 (11), 1956 (625–32). 16 refs. [Cf. *F.A.* 17 Nos. 2490–1.]

1329. IMAZEKI, R. **A new Japanese fungus, *Protodaedalea hispida* Imazeki, gen. et spec. nov.** *Rev. Mycol., Paris* 20 (2), 1955 (158–60 + 1 photo). [E.] I.M.I.

Found on dead branches of *Fagus crenata* and *Acer pictum* [parasitic status not established], the fungus is described and illustrated in colour. It is assigned to Tulasnellaceae, despite fructifications resembling the brackets of *Daedalea* and *Lenzites*.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also Nos. 1425, 2063–4.

1330. TS'UI, Y.-W. [**List of economic plants of North China.**] Department of Botany, Scientific Institution of China, Peking. 1953. pp. xxi + 638. [Chin.] Price [£2. 10*s.*]

Consists of: an introduction; key to families; brief description, with the Latin name, of 1472 species, including many trees, arranged by family and genera, with keys to genera and species (pp. 1–563); a glossary of botanical terms with a definition and the English equivalent; and Chinese and English species indexes.

1331. LIOU, T.-N. [**Illustrated flora of woody plants of N.E. China [Manchuria].**] Institute of Forestry and Soils of the Chinese Academy [Peking?]. 1955. pp. [12] + 568 + 170 plates. [Chin.]

Comprises sections on: geographical distribution of the forest vegetation, explanations of morphological terms employed; tables of mechanical and physical properties of the chief species; keys to families, genera and species, and full botanical descriptions of species, including chief characteristics of the timber and its uses, habitat and method of propagation (pp. 66–521); Chinese and Latin indexes; Latin descriptions of new species; and many photographs, drawings and distribution maps for individual species.

1332. ANDREWS, F. W. **The flowering plants of the Sudan. Vol. III (Compositae—Gramineae).** T. Buncle and Co. Ltd., Arbroath, Scotland. 1956. pp. viii + 579. Price 21*s*. [Cf. *F.A.* 14 No. 1002.]

This third and last volume covers 53 families of Hutchinson's classification from Compositae to Gramineae.

1333. TURRILL, W. B., and MILNE-REDHEAD, E. [Editors.] **Flora of tropical East Africa: Menispermaceae.** Crown Agents for Oversea Governments and Administrations, London. 1956. pp. 32. Price 3*s*.

1334. TURRILL, W. B., and MILNE-REDHEAD, E. **Flora of tropical East Africa: Rhizophoraceae.** Crown Agents for Oversea Governments and Administrations, London. 1956. pp. 20. Price 2*s*. 6*d*.

1335. PARDY, A. A. **Notes on indigenous trees and shrubs of Southern Rhodesia.** *Reprs.* from *Rhod. agric. J.* 52 (5–6), 1955; 53 (1–4), 1956. Each pp. [1] + 1–3 plates, or pp. 7–8 + 7–11 plates. (*Bull. Minist. Agric. Lds., S. Rhod.* Nos. 1840–3, 1851–4, 1862–8, 1875–82, 1891, 1897.)

Bridelia micrantha, Clerodendron glabrum var. *ovale, Cyathea dregei, Euphorbia ingens, Erythrophleum africanum, Dalbergia melanoxylon, Entandrophragma caudatum, Ostryoderris stuhlmannii, Chrysophyllum argyrophyllum, Ekebergia arborea, Markhamia acuminata, Myrianthus holstii, Oncoba spinosa, Sesamothamnus lugardii, Widdringtonia whytei, Conopharyngia elegans. C. stapfiana, Leucospermum ellipticum, Ormocarpum bibracteatum, Rothmannia* (*Gardenia*) *urcelliformis, Salix subserrata, Schrebera trichoclada, Tamarindus indica, Calodendrum capense, Dais cotinifolia, Harungana madagascariensis, Pappea capensis* var. *radlkoferi, Podocarpus milanjianus, Popowia obovata, Protea petiolaris, Strychnos stuhlmannii, Acacia gerrardii, Amblygonocarpus obtusangulus, Diospyros batocana, Hypericum leucoptychodes, Mimusops zeyheri, Rapanea melanophleos,* and *Triplochiton zambesiacus.*

1336. PICKEL, D. B. José. As principais árvores que dão madeira. 4ª contribuição. [**The principal [Brazilian] timber trees. Part 4.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 8, 1955 (56–87). [Port.e.]

Illustrated descriptions of the following species: *Protium heptaphyllum, Pterogyne nitens, Myrocarpus frondosus, Cassia grandis, Pterodon pubescens, Calophyllum brasiliense, Sideroxylon gonocarpum, Phoebe porosa, Tecoma longiflora, Platypodium elegans Vismia brasiliensis, Citharexylum myrianthum, Pterocarpus violaceus, Lecythis pisonis,* and *Tipuana tipu.*

1337. STEENIS, C. G. G. J. VAN [Editor]. **Flora Malesiana (*Ser.* 1).** Noordhoff-Kolff N.V., Djakarta. Vol. 5: pt. 1, 1955; pt. 2, 1956. [E.] O.B.D.

Includes Flacourtiaceae (*H. Sleumer*, pp. 1–106); Salicaceae (*M. Jacobs*, pp. 107–10). Pentaphylacaceae (*C. G. G. J. van Steenis*, pp. 121–4); Proteaceae (*H. Sleumer*, pp. 147–206); and Betulaceae (*C. G. G. J. van Steenis*, pp. 207–96).

174.2/.7. Gymnosperms

See also No. 2062.

1338. JAY, B. A. **Conifers in Britain: an illustrated guide to identification.** Adam & Charles Black, London. 1952. pp. 47 + 136 plates. 23 refs. Price £1. 15*s*.

Includes: notes on the larger genera, with keys to species; key to the genera of conifers; and a list of species with general notes and a glossary. The 136 photographs illustrate the different characteristic types of conifer foliage; each tree described usually has a life-size photograph of the shoot followed by enlarged photos (mostly × 8) of details of stem, buds and leaves. Cones are described but not illustrated, except for the genera *Cupressus, Chamaecyparis, Libocedrus, Thuja* and *Thujopsis,* since the differences in their shoots are frequently difficult to detect whereas their cones are distinctive. The 66 species and varieties described are, with a few exceptions, common forest or ornamental trees.

176.1. Dicotyledons

See also Nos. 1317–8, 1320–1, 1360–1, 2065–8.

1339. FRIES, R. E. **Some new contributions to the knowledge of the Annonaceae in Colombia and Mexico.** *Ark. Bot.* 3 (5), 1956 (433–7 + 4 plates). [E.] O.B.D.

Includes descriptions of the new tree species *Guatteria verruculosa, Unonopsis silvatica, Xylopia chocoensis,* and *Cymbopetalum gracile.*

1340. FRIES, R. E. ***Froesiodendron*, a new genus of Annonaceae from South America.** *Ark. Bot.* 3 (5), 1956 (439–42). O.B.D.

Represented by *F. amazonicum* sp. nov. from Amazonas and *F. surinamense* (transferred from the closely related genus *Cardiopetalum*).

1341. CAVACO, A., and KERAUDREN, M. *Xylopia* (Annonacées) de Madagascar et des Comores. [***Xylopia* spp. of Madagascar and the Comoro Islands.**] *Bull. Soc. bot. France* 103 (5/6), 1956 (274–7). [F.] O.B.D.

Describes 11 new species, of which 10 are trees.

1342. RAO, A. S. **A revision of *Rauvolfia* with particular reference to the American species.** *Ann. Mo. bot. Gdn.* 43 (3), 1956 (253–354 + 1 plate). 53 refs. O.B.D.

1343. HEJTMÁNEK, J. K systematickému hodnocení *Betula atrata* Domin. [**The systematic status of *B. atrata*.**] *Preslia* 28 (3), 1956 (245–9 + 3 plates). 8 refs. [Cz.russ.g.] A.P.B.

B. atrata appears to be no more than a form of *B. verrucosa* with dark-coloured bark; its other characters offer no basis for distinction.

1344. JAFRI, S. M. H. **The genus *Capparis* in W. Pakistan, Afghanistan, and N.W. Himalaya.** *Pakistan J. For.* 6 (3), 1956 (191–202 + 1 map, 1 photo).

Describes 6 species.

1345. LOURTEIG, A., and O'DONELL, C. A. Las Celastráceas de Argentina y Chile. [**The Celastraceae of Argentina and Chile.**] *Natura, Buenos Aires* 1 (2), 1955 (181–233 + 12 plates). 80 refs. [Span.e.]

Moya is reduced to synonymy with *Maytenus*, in which three new combinations are made. The genus *Viposia* is considered as a section of *Plenckia*.

1346. ANDRESEN, J. W. **Bartram Oak in New Brunswick, New Jersey.** *Bull. Torrey bot. Cl.* 83 (2), 1956 (171–2). 9 refs. O.B.D.

Notes on a hybrid Oak identified as × *Quercus heterophylla* (*Q. phellos* × *Q. rubra*) found growing in one of the College of Agriculture forests.

1347. BRENAN, J. P. M. **Notes on Mimosoideae: II.** *Kew Bull.* 1956 (2), (185–205).

Dichrostachys platycarpa is sunk in *D. glomerata*; *D. nyassana* = *D. g.* subsp. nov. *nyassana*. *Acacia* (*bussei* var.) *benadirensis* = *A. latronum* subsp. nov. *benadirensis*; *A. suma* = *A. polyacantha*; *A. campylacantha* = *A. p.* subsp. nov. *campylacantha*; *A. tanganyikensis* sp. nov.; *A. goetzei* subsp. *goetzei* (includes *A. bequaertii* and *A. mossambicensis* Bak. f. (non Bolle)) and subsp. nov. *microphylla* (*A. ulugurensis*, *A. kinionge*, *A. joachimi* and *A. vanmeelii*).

1348. BRUCE, E. A., and LEWIS, J. **Notes on African *Strychnos*: V.** *Kew Bull.* 1956 (2), (267–75).

Section *Densiflora*, with keys to East Tropical African species and to infraspecific taxa of *S. innocua* (including subsp. *burtonii* comb. et stat. nov. and var. *glabra* var. nov.). *S. dysophylla* is maintained with *S.d.* subsp. *engleri* comb. et stat. nov.

1349. SMITH, A. C. **Studies of South American plants. XV.** *Amer. J. Bot.* 43 (8), 1956 (573–7). O.B.D.

Ten species new to Amazonian Colombia are mentioned, including a new tree species, *Virola schultesii*.

1350. KAUSEL, E. Beitrag zur Systematik der Myrtaceen. [**Taxonomy of the Myrtaceae.**] *Ark. Bot.* 3 (5), 1956 (491–516). 44 refs. [G.] O.B.D.

A study in 3 parts based on an analysis of the structure of embryos and observations on the germination of some American species: (1) Definition of the genus *Eugenia*, (2) a new classification of the Myrtaceae, and (3) new American genera. The following new genera are erected to cover species transferred from *Eugenia*, *Myrciaria* and *Myrtus*: *Pseudomyrcianthus*, *Pliniopsis* (a new subgenus of *Plinia*), *Myrciariopsis*, *Acreugenia* and *Pseudanamomis*. The genus *Amyrsia* is redefined.

1351. MORARIU, I., and CIUCĂ, M. *Fraxinus ornus* L.: sistematica, răspîndirea în R.P.R. şi întrebuinţările lui. [***F. ornus*, its systematy, distribution in Rumania, and utilization.**] *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 8 (1), 1956 (209–19). 33 refs. [Rum.rum.russ.f.] O.R.S.

18. Plant Ecology

1352. VÉZINA, P.-E. Recherches sur les forêts de pin Weymouth au Canada. [**On the forests of *Pinus strobus* in Canada.**] *Schweiz. Z. Forstw.* 107 (12), 1956 (721–38). 26 refs. [F.g.]

A plant-sociological investigation, describing the methods employed, the associations in which the Pine occurs and its distribution, together with data on climate, geology and the chemical and physical properties of soils. Its role in the succession of vegetation is never that of a climatic climax, but frequently that of a pioneer species. Most existing stands are the results of fires and pass through several distinct phases, 3 of which are described. Methods of preserving and regenerating the species, which has been greatly depleted and no longer regenerates freely, are discussed.

1353. STOJANOFF [STOJANOV], V. Über die Buchenarten und die Eigenschaften des Buchenholzes in den Wäldern Bulgariens. [**Species of Beech in the forests of Bulgaria, and the properties of their wood.**] *Sitzungsberichte, Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig* 4 (7), 1955. pp. 16. [G.] C.G.B.

The author briefly describes the *Fagus sylvatica* and *F. orientalis* forests, chiefly of the central mountain ranges, their structure characterized by high volumes (450–700 cu.m./ha.) with few stems > 50 cm. in diam. and a preponderance of very thin stems and a natural admixture of other species. He discusses differences in site requirements between the two species, the morphological and ecological (including transitional) types of *F. orientalis* found at different altitudes; and reports on an investigation into the technological properties of their woods [see *F.A* 13 No. 1498], stressing the fact that wood with wide growth rings was found to be heavier and more resistant to compression than wood with narrow rings, a finding that contradicts a statement by Kollmann in his *Technologie des Holzes und der Holzwerkstoffe* [cf. *F.A.* 13 No. 2385].

1354. JACOBS, M. R. **Eucalypt woodland in Australia. Background factors influencing occurrence and treatment.** *Unasylva* 10 (3), 1956 (110–4).

A paper prepared for the World Eucalyptus conference, Rome, 1956, dealing with the effect on succession and regeneration of fire, grazing and utilization, in both savanna woodlands and high-quality forest, and touching on questions such as seed trees, chemical control of seed-eating insects, and the applicability of Australian methods and experience elsewhere.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

1355. BAUMGARTEN, W. Zum Vorkommen der Weisstanne auf der südwestlichen Alb. [**The occurrence of *Abies alba* on the S.W. part of the Alb [Swabian Jura].**] *Allg. Forst- u. Jagdztg.* 126 (11/12), 1955 (243–6). 3 refs. [G.e.]

Traces the history of Silver Fir in the district and describes its present distribution by age classes. The reasons for frequent failures in this century, in contrast to successful advance plantings and sowings in the later half of the 19th, are seen in increased game stocking combined with lack of funds for tending and fencing.

1356. LONGHI, G. Alcune osservazioni fitogeografiche e biologiche sul pino loricato (*Pinus heldreichii* Christ., var. *leucodermis* Ant.) [**Some ecological and biological notes on *P. heldreichii* var. *leucodermis*.**] *Ital. for. mont.* 11 (5), 1956 (227–8). 2 refs. [It.]

Notes on the occurrence of this species in Italy, with description of sites, seed production, dimensions of large specimens etc.

1357. Numero speciale dedicato a latifoglie varie (prima parte). [**Special number devoted to various broadleaved species (Part 1).**] *Monti e Boschi* 7 (11/12), 1956 (489–608). [It.]

Contains a number of articles covering botanical and silvicultural characters, wood properties and uses, and pests of the following species grown in Italy: *Populus* spp. (*E. Allegri*); *Salix* spp. (*E. Magini*); *Betula* spp. (*A. Pavari*); *Alnus* spp. (*L. Susmel*); *Ulmus* spp. (*G. Gambi*); *Celtis australis* (*A. Pavari*); *Acer* spp. (*R. Corti* and *A. Pavari*); *Tilia* spp. (*G. Gambi*); and *Fraxinus* spp. (*E. Magini*).

1358. Essências florestais da Guiné Portuguesa. 2; 3. [**Forest species of Portuguese Guinea. 2; 3.**] Jardim e Museu Agrícola do Ultramar, Ministério do Ultramar, Lisboa. 1956. pp. 15 + 4 plates; 13 + 4 plates. [Port.e.f.]

Morphology, habitat, nomenclature, range, and the anatomy, properties and uses of the wood, of Pau Sangue (*Pterocarpus erinaceus*) and Metondo (*Cordyla africana*).

181.1. Distribution, Natural Range

1359. PAŞCOVSCHI, S. A crescut vreodată pin spontan în pădurile Dobrogei? [**Have any Pines ever been indigenous in the forests of the Dobrudja?**] *Rev. Pădurilor* 71 (3), 1956 (137–9). 12 refs. [Rum.rum.russ.g.]

Concludes from historical and ecological evidence that it is not impossible that there were formerly indigenous Pine stands in this area, though it is uncertain whether they were of *Pinus nigra* or of *P. sylvestris*.

1360. COSTIN, E. Contribuţii la cunoaşterea răspîndirii unor specii şi varietăţii de *Quercus* in pădurile din sudul Moldovei. [**The distribution of some species and varieties of *Quercus* in the forests of southern Moldavia.**] *Rev. Pădurilor* 70 (12), 1955 (576–9). 8 refs. [Rum.rum.russ.]

Deals with *Quercus virgiliana* (described in detail), × *Q. corcyrensis*, × *Q. budensis*, and a number of forms and varieties of *Q. pubescens*.

1361. TUCKER, J. M., and MULLER, C. H. **The geographic history of *Quercus ajoensis*.** *Evolution* 10 (2), 1956 (157–75). 10 refs. O.R.S.

Populations of *Q. ajoensis*, restricted to a few high canyons in the Ajo Mountains, Arizona, *Q. turbinella* from the New York Mts., California, and hybrid populations from the Castle Dome, Kofa and Eagle Tail Mts., Arizona, were examined on the basis of leaf characteristics. The populations of *Q. turbinella* and *Q. ajoensis* differed considerably in all characteristics, and the hybrid populations were in general intermediate. *Q. ajoensis* occurs in late Tertiary deposits in Washington, associated with a warm-temperate or subtropical flora. It may be concluded that it is a subtropical species, forced southwards by lower temperatures and eliminated from the southern lowlands by progressively increasing drought.

1362. BRENNEMAN, W. S. **Red Pine indigenous to Illinois?** *J. For.* 54 (11), 1956 (775).

Five trees of *P. resinosa* have been found growing on the Fox River, Illinois. As one tree has a d.b.h. of 17·5 in. it is probably ca. 160 years old. There is no previous record of *P. resinosa* in Illinois.

1363. HOCKER, H. W., JR. **Certain aspects of climate as related to the distribution of Loblolly Pine.** *Ecology* 37 (4), 1956 (824–34). 40 refs.

A study was made of the relation between certain climatic variables and the natural distribution of Loblolly Pine. All basic climatological data used were obtained from records made by U.S. Weather Bureau observers during the period 1921—1950. There were 207 climatological stations represented in the study, 102 within the present natural range of Loblolly and 105 outside but within an area adjacent to it. To determine whether there is a significant climatic difference between the two regions, statistical analysis of the data was made by methods appropriate to the discriminant function. Twelve factors were found to contribute significantly to the climatic difference between the two regions, from which a discriminant equation was derived that can be applied as a means of classifying a given location with reference to the climate of the Loblolly region. When the appropriate data for a given climatological station are substituted in the equation, a calculated positive value indicates a climate similar to, whereas a negative value indicates a climate dissimilar from that within the Loblolly region. Using this equation, the chances are 5 in 6 that any station from a selection of stations chosen at random will be correctly classified. The calculated climatic limits of Loblolly, based upon the 0·00 discriminant value, followed rather closely the natural distribution limits of the species. Average temperature, and frequency and intensity of precipitation during both the winter and the summer season, appear to be the factors contributing most to limiting the distribution of Loblolly. It is believed that the effect of average winter temperature would be through its influence upon the availability of soil moisture. *From author's summary.*

1364. WAHLENBERG, W. G., and OSTROM, C. E. **Geographic variation in climate in the Loblolly Pine region.** *Res. Note Stheast. For. Exp. Sta.* No. 94, 1956. pp. 2. 1 ref.

Showing climographs plotting mean monthly temperatures over mean monthly rainfalls for 9 stations.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 1288, 1363–4, 1467 *et seq.*, 1510, 1538, 1732 *et seq.*

1365. WAXMAN, S., and NITSCH, J. P. **Influence**

of light on plant growth. *Amer. Nurserym.* 104 (10), 1956 (11–2).

At Cornell University, N.Y., in spring 1955, seedlings, cuttings and large potted plants of deciduous trees, shrubs and evergreens were exposed to 9 hours of daylight and then to light periods increased artificially to 12, 15, 18, 21 or 24 hours. At a minimum temperature of 70° F. plants exposed to ⩾ 15 hours of light grow and produce new leaves continuously; some have been growing for 15 months without becoming dormant. Cuttings of *Cornus florida* receiving 18 hours of light per day grew to 8 ft. after one year; the controls grown naturally in daylight were 10 in. high. Plants responding best to long periods of light are: *C. florida*, *C. kousa* and *Weigela florida*. Light periods of ⩽ 12 hours cause dormancy in plants, but this can be broken if plants retaining their leaves are given 18 hours of light. At a minimum temperature of 50° only plants receiving 21 or 24 hours of light maintain continuous growth. A 'light-break' treatment of one hour of light in the middle of 15 hours of darkness kept *Cornus* spp., *Viburnum opulus* and *W. florida* growing, whereas 10 consecutive hours of light would not have prevented dormancy.

1366. McDERMOTT, R. E. **Seedling tolerance as a factor in bottomland timber succession.** *Res. Bull. Mo. agric. Exp. Sta.* No. 557, 1954. pp. 11. 6 refs.

In the successional sequence of Missouri bottomland timber species, an early shrub stage, often characterized by Alder [*Alnus rugosa*] is replaced by a stage in which Sycamore [*Platanus occidentalis*] and River Birch [*Betula nigra*] may be prominent. This in turn is commonly replaced by a Maple/Elm/Ash community. In general, it is assumed that this succession represents a trend from shade-intolerant to shade-tolerant species. To test this assumption, very young seedlings of Alder, Sycamore, River Birch, Elm [*Ulmus alata* and *U. americana*] and Red Maple [*Acer rubrum*] were grown in 4 sunlight intensities: full, ½, ⅓, and ¼. On the basis of height growth and shoot/root ratios, it was found that Alder and River Birch are quite intolerant, the Elms moderately tolerant, and Red Maple tolerant. Contrary to expectations, Sycamore seedlings are at least as tolerant as the Elms, and the fact that Sycamore reproduction is lacking in Sycamore stands and that the tendency is usually towards Elm reproduction, cannot be primarily due to differences in light requirements. Changing seedbed conditions may account for this trend. *From author's summary.*

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 1232–5, 1243, 1246, 1253–4, 1278–9, 1283, 1410, 1488, 1552, 1575, 1588 *et seq.*, 1741–3, 1935, 1973, 2091.

1367. BHATIA, K. K. **Contribution to the ecology of Teak (*Tectona grandis* Linn.) in Madhya Pradesh.** *Sci. & Cult.* 21 (12), 1956 (721–6). 18 refs. E.M.B.

Covers similar ground to that already covered [cf. *F.A.* 17 No. 3707] with heavy emphasis on the calcicolous habit of the better grown Teak.

1368. HILF, H. H. Standortsansprüche von Pappelsorten. **[Site requirements of Poplar varieties.]** *Holzzucht, Reinbek* 10 (5), 1956 (37–8). 2 refs. [G.]

Chiefly a discussion of method, advocating a 'clinical' approach to practical questions, which bases recommendations on practical experience as viewed in the light of fundamental research, in anticipation of scientifically established results. The author compares his own tentative scheme for allocating varieties to site types [cf. *F.A* 14 No. 1122] with a revised scheme based on H. F. Joachim's classification [cf. *F.A.* 17 No. 3716].

1369. EGBERTS, H. De invloed van de zuurgraad (pH) van de grond op verschillende boomkwekerijgewassen. **[The effect of soil pH on different nursery plants.]** *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (68–9). [Du.]

Plots with pH values ranging from 3·8 to 6·8 were planted in spring 1954 and plants lifted, examined, weighed and measured, in autumn 1955. *Tilia platyphyllos* grew best at pH 5·5–5·9, *Ligustrum ovalifolium* at pH 6·1–6·8 and *Crataegus monogyna* showed no clear correlation with pH.

1370. WAID, J. S. **Root dissection: a method of studying the distribution of active mycelia within root tissue.** *Nature, Lond.* 178 (4548), 1956 (1477–8). 2 refs.

Roots are washed by agitation in 10 changes of 10 ml. of sterile water, and then cut into 2-mm. fragments from which the outer cortex is dissected, leaving the central cylinder comprising the inner cortex and stele. Dissection is carried out in dishes of sterile water. The 2-mm. fragments of (*a*) outer and (*b*) inner cortex and of (*c*) intact roots are placed on 3 separate series of plates of agar and incubated for 3 weeks at 25° C. The results show great differences in the mycelial populations of the root surfaces of (*a*), (*b*) and (*c*). Some of the sterile species of fungi isolated from (*b*) are rarely obtained from (*c*), presumably because they could not compete in mixed culture with such surface-inhabiting species as *Trichoderma viride* or *Mucor* spp. Attempts were made to isolate the mycorrhizal fungi associated with Beech (*Fagus sylvatica*). Microscopic inspection showed that the outer layers of the hyphal mantle which encloses the cortex of infected roots of Beech consisted of the hyphae of several species of fungi, some of which were non-septate and some septate with dark-coloured hyphal walls. To avoid contamination of the ectotroph by the non-mycorrhizal fungi that inhabit the mantle surface, the mycorrhizal roots were washed in sterile water and the mycorrhizal mantle was then removed by dissection. Several kinds of sterile mycelium were isolated from the root cortex in various types of culture media, and it is possible that they had occupied the intercellular spaces of the outer cortex, i.e. the region of the Hartig net. Fungi isolated from the hyphal mantle were mainly sporing forms.

1371. SLANKIS, V. **Causality of morphogenesis of mycorrhizal Pine roots.** *Abstr.* in *Proceedings, 22nd Session Canadian Phytopathological Society, Edmonton 1955* No. 23, 1956 (20–1). I.M.I.

In laboratory experiments with various growth regulators it was possible to reproduce dichotomously branched short roots resembling coralloid mycorrhizae and also formations resembling single and tubercle mycorrhizae and intermediate forms. It is concluded that when the growth regulators exuded by mycorrhizal fungi reach a certain concentration, they inhibit the elongation of the invaded root. This causes hypertrophy of the cortex cells resulting in swelling and preventing the formation of root-hairs. The growth of long roots also could be influenced by growth regulators.

1372. DOMINIK, T. Projekt nowego podziału mikoryz ektotroficznych oparty na cechach morfologiczno-anatomicznych. [**Proposed new classification of ectotrophic mycorrhizae, based on morphological and anatomical characters.**] *Roczn. Nauk leśn.* No. 14, 1956 (223–46). 10 refs. [Pol.russ.g.]

Twelve subtypes are recognized. Melin's type A corresponds to 8 new subtypes, his types C, D_a and D_n to 3 new subtypes. The 12th subtype is identical with Pachlewski and Gągalska's type E [cf. *F.A.* 15 No. 2332].

1373. DOMINIK, T. Mikotrofizm topól w ich naturalnych zespołach na terenie Polski. [**The mycotrophy of Poplars in their natural communities in Poland.**] *Roczn. Nauk leśn.* No. 14, 1956 (247–66). 12 refs. [Pol.russ.g.]

Melin's classification of mycorrhizae appears unsuitable for Polish Poplars because all of the mycorrhizae observed belong to Melin's type A. *Populus nigra* and *P.n.* var. *italica* are always mycotrophic (both species show a difference in mycorrhiza subtypes between seedlings and older plants). *P. alba* is mostly autotrophic; in communities it forms a mycorrhiza, though not a typical one. *P. tremula* is always mycotrophic and forms characteristic mycorrhiza types. *P. canescens* is characterized by only one mycorrhiza subtype.

1374. PACHLEWSKI, R. Badania mikotrofizmu naturalnych zespołów roślinnych na hałdach żużlowo-łupkowych w Wałbrzychu. [**Investigations on the mycotrophy of natural plant communities on the slag-slate heaps at Wałbrzych [Poland].**] *Roczn. Nauk leśn.* No. 14, 1956 (267–92). 15 refs. [Pol.pol.russ.g.]

In studies (1954–55) at two mines, abundant mycorrhizae were found on all trees and shrubs, although soil conditions allowed only a few fungus species to form them. *Populus tremula, Betula verrucosa, Salix caprea, S. aurita* and *Pinus sylvestris* show only one type of ectotrophic mycorrhiza. Trees introduced artificially showed a strong mycotrophy.

1375. BORISOVA, N. A. Mikotrofnostj drevesnyh i kustarnikovyh porod Urdinskih peskov. [**Mycotrophy of tree and shrub species on the Urda sands [W. Kazakhstan].**] *Bot. Ž.* 41 (6), 1956 (876–80). 17 refs. [Russ.]

Small-scale studies were made in 1952 of mycorrhizae on (*a*) 3-month-old nursery seedlings of *Pinus nigra* var. *caramanica* in bare sand, (*b*) 7- to 10-year *P. sylvestris*, self-sown among sparse herbaceous cover in depressions, and (*c*) 40-year Pines [*P. sylvestris*?] in stands with an underwood of *Elaeagnus angustifolia* and *Phragmites communis* in the field layer. Roots of (*c*) had abundant coralloid, simple or forked mycorrhizae, with fine, dark-brown, branched, multicellular hyphae (and sometimes thicker, unbranched hyphae intermixed) forming a dense mantle. Roots of (*a*) and (*b*) had only a very loose mantle of sparse, colourless or pale yellow hyphae, either unbranched or branched and multicellular. These two types of mycorrhizae appear to be formed by different species of fungus, and the difference in mycorrhizal development is thought to be associated with differences in soil development, litter accumulation etc. Brief descriptions are included of mycorrhizae formed on a hybrid Poplar, *Quercus robur, E. angustifolia, Betula verrucosa, Alnus glutinosa* and *Salix caspica.* All these mycorrhizae are believed to have occurred without artificial soil inoculation.

1376. STRELKOVA, O. S. Mikorizy rasteniĭ tundry i lesotundry na Taĭmyre. [**Mycorrhizae of tundra and forest-tundra plants in the Taimir Peninsula.**] *Bot. Ž.* 41 (8), 1956 (1161–8). 26 refs. [Russ.]

Studies were made in E. Siberia on 104 species of herbaceous plants, dwarf shrubs and *Larix dahurica, L. sibirica, Alnus fruticosa, Betula exilis* and *Salix* sp. Mycorrhizal relationships were established for 39 species, including the above. The mycorrhizae were mostly endotrophic, no typical ectotrophic forms being found. No Hartig net occurred, and the fungi were distributed more or less homogeneously in the intercellular spaces and cells. These features are probably a result of the poor soil aeration, low temperatures and waterlogging.

1377. PRYOR, L. D. **Chlorosis and lack of vigour in seedlings of renantherous species of *Eucalyptus* caused by lack of mycorrhiza.** *Proc. Linn. Soc. N.S.W.* 81 (1), 1956 (91–6 + 3 photos). 14 refs. D.S.I.R.

Poor growth and chlorosis in seedlings of some renantherous species are corrected by the addition of *Scleroderma flavidum* spores, which leads to the formation of an ectotrophic mycorrhiza. [Cf. *F.A* 17 No. 2544.]

1378. PURVIS, C. **The root system of the Oil Palm: its distribution, morphology, and anatomy.** *J. W. Afr. Inst. Oil Palm Res.* No. 4, 1956 (60–82 + 6 photos, 7 dgms.) 16 refs.

1379. COSTIN, E., *et al.* Studiul sistemului de înrădăcinare şi al părţii aeriene la cîteva specii forestiere, în raport cu eroziunea solului. [**The root system and aerial parts of some forest tree species in relation to soil erosion.**] *Bull. şti. Acad. Repub. rom. (Sect. Biol.)* 8 (2), 1956 (339–80). 14 refs. [Rum. rum.russ.f.*f.*] O.R.S.

A study was made of young (3–5 years) trees of *Prunus mahaleb, Quercus pedunculiflora* and *Pinus sylvestris* in order to determine the development of

the root system and of the aerial parts and the relation between the two at different ages and in soils of diminishing fertility. The subjects of study were grown in severely eroded, moderately eroded and slightly eroded (control) soils. The main findings were as follows: Root growth is the more active during the first 3 years, and growth of the aerial parts between the 3rd and 5th years; both are reduced by increasing erosion, but aerial growth more than that of roots. In all species, the densest mass of roots was found in the first 30–40 cm. A close relation existed between weight of foliage and weight of roots. It is concluded that *P. sylvestris* may be planted on severely eroded, *P. sylvestris* and *Prunus mahaleb* on moderately eroded, and all three species on slightly eroded, soils.

1380. LEMKE, K. Untersuchungen über das Wurzelsystem der Roteiche auf diluvialen Standortsformen. **[Researches on the root system of the Red Oak on glacial drift sites [in E. Germany].]** *Arch. Forstw.* 5 (1/2; 3/4), 1956 (8–45; 161–202). 87 refs. [G.g.]

Covers in detail: a description of the root system in seedling, sapling and tree; root spread, depth, and fine rooting of dominant, subdominant and suppressed trees on 11 sites; changes with age; root distribution in the soil horizons (shown in profile diagrams with data on numbers of roots per sq. m. of face by one-mm. diameter gradations and lengths of the same per litre of soil for each horizon); mutual effects of root system and site factors, and general dependence of rooting on the site; relation of root system and above-ground growth for different sites and crown classes (illustrated by scale diagrams, showing crown length and diameter, bole diameter, depth and spread of rooting and depth at which horizontal rooting occurs); ring counts on saplings, with diagrams comparing growth in stem height and vertical and horizontal root length at 2-year intervals; and a comparison with the root systems of indigenous Oak, Beech and Alder. Young Red Oak has a tap-root system developing later, according to site, into a 'heart-root' system (diagonal roots from the root-crown) in dominant trees. Suppressed trees have a horizontal to horizontal-heart-root system. The Red Oak is a vigorous rooter exploiting the soil intensively and in depth, in a manner essentially similar to that of the indigenous Oaks. The root system, having a strong positive correlation with above-ground growth in older trees, can be improved by thinnings, and for full soil exploitation in pure stands thinning from above should be applied to encourage a middle- and underwood. The species is recommended for fertile and medium sands, and sands overlying loam. Its planting on gley-type soils should be extended.

1381. KOŠČEEV, A. L. Lesovodstvennoe značenie pridatočnyh korneĭ drevesnyh porod v uslovijah zabolačivanija lesosek. **[The silvicultural significance of adventitious roots on tree species in waterlogged clear-felled areas.]** *Trud. Inst. Les.* No. 13, 1953 (116–29 + 11 photos). 8 refs. [Russ.]

[Cf. *F.A.* 16 No. 3886.] From observations in the Leningrad area it was found that on waterlogged clear-felled areas abundant adventitious roots may be formed on Spruce, Birch and Aspen. Apparently they may be formed on all northern Russian woody plants, their development differing with the species. They appear in greatest number when the tree is 25–30 years old, arising at the butt under the moss cover and replacing parts of the root system that have died owing to excessive moisture, moss growth, and the development of peat.

1382. KRASILJNIKOV, P. K. Pridatočnye korni i kornevaja sistema u kedra v centraljnyh Sajanah. **[Adventitious roots and the root system of *Pinus sibirica* in the central Sayan Mts.]** *Bot. Ž.* 41 (8), 1956 (1194–206). 27 refs. [Russ.]

Discusses the significance of adventitious roots in *P. sibirica* growing in the central Sayan Mts., the author maintaining that under these conditions only stands which have developed adventitious roots reach timber size. Seeds germinating in moss cover form adventitious roots above the hypocotyl; the typical development of an adventitious root system is described. Sixty-year-old Pines had developed a surface root system in the top horizon, the depth of which rarely exceeds 30–40 cm. while the radius extends to 12 or even 15 m. The thick horizontal roots had developed sinkers to a depth of 20–40 cm., where these had ramified, forming a second horizontal layer. On waterlogged soils growth is slower and the primary root system dies early. Where there is no moss cover, only a little-branched primary root system develops, and growth is slow.

1383. CIUMAC, G. Fenomenul concreşterii rădăcinilor la plante lemnoase şi importanţa pe care o prezintă pentru practica silvica. **[Natural root-grafting in woody plants and its importance for silvicultural practice.]** *Rev. Pădurilor* 71 (3), 1956 (139–42). 6 refs. [Rum.]

Reviews some Russian literature on the subject and includes a table showing % of Pine with root-grafts in several different forest types and at different ages.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 1272, 1429, 2073–4.

1384. SUKAČEV, V. N. O vnutrividovyh i mežvidovyh vzaimootnošenijah sredi rasteniĭ. **[Intra- and interspecific relations between plants.]** *Soobšč. Inst. Les.* No. 1, 1953 (5–44). 82 refs. [Russ.russ.]

A critical review of literature (chiefly Russian) and some unpublished work by the author and his colleagues, on competition and 'mutual aid' between plants, with the aim of demonstrating both favourable and unfavourable effects of plants upon one another, whether they are of the same species or not, and of clearing up confusions in theory and practice that have arisen from the Lysenko school's denial of the existence of intraspecific competition.

181.5. Reproductive Behaviour

See also Nos. 1366, 1396, 1404, 1454 *et seq.*, 1492 *et seq.*

1385. IACOVLEV, A. Marcotaj natural la cîteva specii exotice din parcul dendrologic Mihăieşti-

Mușcel. [**Natural layering in some exotic species in the Mihăiești-Mușcel arboretum.**] *Rev. Pădurilor* 70 (12), 1955 (580–2). 5 refs. [Rum.]

Describes occurrences of natural layering in *Thuja plicata, T. occidentalis, Chamaecyparis lawsoniana,* and *Tsuga canadensis.*

1386. FROLOVA, G. D. Voprosy biologii cvetenija nekotoryh berez. [**The biology of flowering in some Birches.**] *Bot. Ž.* 41 (6), 1956 (885–9). [Russ.]

Studies of flowering period, pollen germination and cross-pollination were made in Orel province during 1947–50 on *Betula verrucosa, B. pubescens, B. platyphylla, B. rezniczenkoana, B. papyrifera, B. excelsa, B. populifolia, B. costata, B. ermanii, B. lutea* and *B. lenta.* Open pollination gave low seed-set, as bad weather limited the amount of pollen in the air. Much of the fruit was parthenocarpic; there was little dichogamy except in *B. papyrifera* (protandrous) and *B. excelsa* (proterogynous). In artificial pollinations between flowers on the same tree, the seed-set was much better when pollen was taken from a flower on the opposite side of the crown than when pollen from a neighbouring flower was used. From the similarity in conditions for pollen germination in aqueous agar culture (optimum sugar concentration $< 10\%$) and the overlapping flowering periods, it is considered that natural hybridization is not only possible but inevitable. Pollen stored best when left in the ♂ catkins on cut branches.

1387. WOOD, G. H. S. **The Dipterocarp flowering season in North Borneo, 1955.** *Malay. Forester* 19 (4), 1956 (193–201). 2 refs.

Includes tabulated data on: (1) Dipterocarp flowering, illipe-nut production and annual rainfall during the period 1909–55, and (2) monthly rainfall before heavy flowering seasons. The evidence does not support the common assumption that heavy flowering is related to dry years, though a heavy monsoon followed by an unusually dry period may induce flowering in trees prepared for it by a gradual physiological process over a number of years.

1388. DORMAN, K. W., and BARBER, J. C. **Time of flowering and seed ripening of Southern Pines.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 72, 1956. pp. 15. 16 refs.

Tabulates approximate dates in 1956 for pollen and seed ripening for Slash, Longleaf, Loblolly and Shortleaf Pines throughout their natural ranges, with similar data from a few stations for some minor Pine species. There was a strong correlation between time of pollen ripening and latitude.

1389. HÅKANSSON, A. **Seed development of *Picea abies* and *Pinus sylvestris*.** *Medd. SkogsforsknInst., Stockh.* 46 (2), 1956. pp. 23. 12 refs. [E.e.sw.] Price *Kr.*2.

An illustrated study, made near Stockholm, of the stages of seed development in Norway Spruce pollinated on 25 May, 1954, and Scots Pine, pollinated at the end of May 1953. Fertilization in both species occurred near midsummer 1954 and embryo development, which went fairly parallel in both species, was completed in August.

1390. BLACK, M. **Interrelationships of germination inhibitors and oxygen in the dormancy of seed of *Betula*.** *Nature, Lond.* 178 (4539), 1956 (924–5). 3 refs.

Experimental work on seed of *B. pubescens* indicates (1) the presence of a germination inhibitor in the pericap, and (2) the stimulating effect of oxygen on germination. Removal of the seed-coat simultaneously removes (1) and activates (2). The mechanism by which these factors work is discussed. The role of light, which is ordinarily necessary to germination, is still uncertain.

1391. ASAKAWA, S. [**Studies on the delayed germination of *Fraxinus mandshurica* var. *japonica* seeds. (1), (2), (3).**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 83, 1956 (1–38). 50 refs. [Jap.jap.e.*e.*]

Reviews the literature and reports on comparative studies with the Japanese and 3 western species of *Fraxinus*: seed and embryo morphology, dormancy and conditions for release, including experiments on pre-germination and seed physiology, using excised embryos, and the influence of pericarp extracts. The account is in 3 parts, each with a detailed English summary. [Cf. *F.A.* 16 No. 92.]

1392. MUEGGLER, W. F. **Is Sagebrush seed residual in the soil of burns or is it wind-borne?** *Res. Note Intermt. For. Range Exp. Sta.* No. 35, 1956. pp. 10.

Thick stands of *Artemisia tridentata* were burned for several years in Idaho, and bare and covered plots laid out to control seeding. It is concluded that seed stored in the soil retains its germinative capacity after burning and that most seedlings on burnt areas originate from residual seed; wind-borne seed is restricted to areas near its source.

1393. MERZ, R. W., and BOYCE, S. G. **Age of Oak 'seedlings'.** *J. For.* 54 (11), 1956 (774–5). 5 refs.

Out of 100 Oaks $< 4{\cdot}5$ ft. high and apparently of seedling origin, dug up from a 5-acre plot in an Oak/Hickory stand in Ohio two years after a selective felling, only 12 were true seedlings. About 75 had apparently developed from true buds, but in some the roots were $>$ 30 years older than the stems. Only 26 had stems and roots of equal age and no relationship appeared to exist between the root and stem age of the others. U.S. literature on the subject and the desirability of this class of reproduction are discussed. [Cf. *F.A.* 18 No. 432.]

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 1732, 1968.

1394. KRAVČENKO, S. M. O proizrastanii duba kurčavogo (*Quercus crispula* Blume) na Sahaline. [**Growth of *Q. crispula* on Sakhalin.**] *Bot. Ž.* 41 (8), 1956 (1184–6). [Russ.]

Discusses the morphological and biological characters of *Q. crispula,* based on personal observations and herbarium material. It grows on the

S.W. tip of Sakhalin and can reach a height of 12–14 m. and a diam. of 40–65 cm. on sheltered sites. The distribution of *Q. mongolica* extends further north along the W. coast, and natural hybrids of the two species are found at Kholmsk and on the S. Sakhalin lowlands.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See No. 1292.

181.8. Phenology

See also Nos. 1285–6, 1288–9, 1310–1, 1365, 1386–9, 1987, 2091.

1395. FRASER, D. A. **Ecological studies of forest trees at Chalk River, Ontario, Canada. II. Ecological conditions and radial increment.** *Ecology* 37 (4), 1956 (777–89). 28 refs.

[Cf. *F.A.* 16 No. 208.] The annual variations in canopy, air and soil temperature, rainfall, and soil moisture are described for 3 sites of an 8-acre plot, for the 1949–53 period. Correlations are made between these data and the radial growth of 8 forest tree species. Cambial activity at the 4-foot level in these trees was investigated by sectioning of samples of bark and outer wood, and by periodic measurements of radial increment with a dial-gauge dendrometer. The number of layers of undifferentiated cells in the cambial zone is a reliable index of the current rate of cambial activity, and when a constant minimum number of layers is reached, radial growth has ceased. The dendrometer readings become constant at the same time.

The time of initiation of growth appeared to be controlled by late winter and early spring temperatures, since the soil at this season had always sufficient moisture for growth. On wet sites, a thick organic horizon delays the spring warm-up of the soil, which consequently retards initiation of growth. Cambial activity in the stem of all trees studied had ceased by early September even on sites where neither moisture nor temperature were limiting factors. *From author's summary.*

1396. TURNER, R. M. **A study of some features of growth and reproduction of *Pinus ponderosa* in Northern Idaho.** *Ecology* 37 (4), 1956 (742–53). 14 refs.

A quantitative study was made of some features of growth in two age classes of *P. ponderosa* at two elevations in northern Idaho differing by about 670 m. The higher of the two stands belongs to the *P. ponderosa*/*Symphoricarpus rivularis* association and the lower to the *P. ponderosa*/*Physocarpus malvaceus* association, but the usual altitudinal sequence of these associations is reversed, for owing to microclimatic compensation the association with the better moisture balance occurs at the lower elevation. All structures studied started growth earlier in the lower stand, presumably because of the earlier onset of warm spring weather. The growth patterns of the branches, stems and needles were different; this pattern also differed in a characteristic manner between the two size classes of trees. Elongation of branch apices and staminate cones begins first, followed by radial growth of the stem, and finally needle elongation. The ♂ cones complete their development and the pollen is shed shortly after needle elongation commences. Needle fall occurs in autumn after the other structures studied have essentially completed their annual growth, and coincides with shrinkage of stem diameter. This autumnal shrinkage was not so severe in the lower as in the upper stand, presumably because of a better moisture balance. The younger trees appeared to respond more to moisture balance changes than the older trees during the period of autumn drought. *From author's summary.*

182. Synecology, Plant Sociology: General, Principles and Methods

1397. KEAY, R. W. J. **African vegetation: meeting at Yangambi.** *Nature, Lond.* 178 (4545), 1956 (1273–4).

An account of a meeting of specialists in phytogeography held July 29–Aug. 8, 1956, in the Belgian Congo under the auspices of the Conseil Scientifique pour l'Afrique au Sud du Sahara and the Commission de Co-opération technique en Afrique au Sud du Sahara, with the aim of promoting international co-operation in this field, similar to that effected by A.E.T.F.A.T. in the field of plant taxonomy.

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 1301–3, 1361, 1409, 1411, 1929, 2315.

1398. VOLGER, C. Forstgeschichtliche Untersuchungen zu Fragen der natürlichen Holzartenverbreitung aus dem Hannoverschen Wendlande. **[Historical investigations into the natural distribution of woody species in the Wendland ['Slav country'] of Hanover.]** *Allg. Forst- u. Jagdztg.* 127 (7), 1956 (145–54). 38 refs. [G.g.]

From an analysis of the old Slav place-names and old records the author concludes that the region between the Lüneburg heath and the Elbe river, including the Elbe valley, was covered by forests in which Pine preponderated and Oak and Birch were plentiful.

1399. CORTI, R. Richerche sulla vegetazione dell' Etruria. X. Aspetti geobotanici della selva costiera. La selva pisana a S. Rossore e l'importanza di questa formazione relitta per la storia della vegetazione mediterranea. **[Studies on the vegetation of Etruria. X. Geobotanical aspects of the coastal forest. The Pisan forest of S. Rossore, and the importance of this relict formation for the history of Mediterranean vegetation.]** *Nuovo G. bot. ital.* (*n.s.*) 62 (1/2), 1955 (75–262 + 1 map, 53 photos). 78 refs. [It.it.e.] A.P.B.

Earlier papers in this series appeared in 1936–8.

1400. HEUSSER, C. J. **Post-glacial environments in the Canadian Rocky Mountains.** *Ecology* 37 (4), 1956 (260–302). 180 refs.

Pollen analysis showed the sequence Pine/Spruce/Fir in the earliest record, succeeded by Pine/Spruce/Douglas Fir, thence Pine/Spruce/Fir, and finally Pine/Spruce/Western Hemlock.

1401. McVEAN, D. N. **Ecology of *Alnus glutinosa* (L.) Gaertn. VI. Post-glacial history.** *J. Ecol.* 44 (2), 1956 (331–3). 7 refs.

[Cf. *F.A.* 17 No. 3703; 18 No. 1402.] Briefly discusses salient features in the European history of the Alder. Autecological studies indicate that the sudden increase of Alder pollen in the Late Boreal period was brought about by (1) a rise in the sea-level producing higher water-tables and initiating hydroseres, (2) an increased evaporation/precipitation ratio leading to a moist soil surface in spring which enabled the Alder to spread from one fen to another, and (3) climatic or biotic factors destroying the existing vegetation. Some evidence of recent climatic change in the British Isles, indicated by the structure and reproduction of hill Alder woods in the north and west, is presented.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 1233–4, 1366, 1416, 1421, 1429–30, 1432, 1435, 1456.

1402. McVEAN, D. N. **Ecology of *Alnus glutinosa* (L.) Gaertn. V. Notes on some British Alder populations.** *J. Ecol.* 44 (2), 1956 (321–30). 13 refs.

[Cf. *F.A.* 18 No. 1401.] Describes Alder populations in the New Forest, Norfolk, N. Wales, Sutherland and Invernessshire. The details of floristics and succession are discussed. The Alderwood flora is influenced by the composition of the vegetation it has succeeded; 50% of Alderwood species are from fen and marsh associations and only 5% are woodland species. Alder communities are most distinct on wet sites rich in bases (the relationship of soil water and base content to subordinate species is tabulated); on drier and less basic soils they merge with Oak, Ash and Birch communities. The Alder colonizes hydroseres particularly quickly where fen successions have been deflected by mowing or grazing, but it does not invade grassland. It is suggested that the conditions required for a climax Alder carr are enough light and enough surface above water to permit regeneration from seed; it is unlikely that the community could be perpetuated by vegetative regeneration alone.

1403. BRIERLEY, J. K. **Some preliminary observations on the ecology of pit heaps.** *J. Ecol.* 44 (2), 1956 (383–90 + 3 photos). 6 refs.

Presents data on the colonization of pit-heaps in the Nottinghamshire-Derbyshire coalfield, including the natural establishment of *Betula verrucosa*.

1404. ROUSSEL, L. À propos d'une nouvelle étude sur le phénomène d'alternance. **[A recent study on the phenomenon of alternation.]** *Bull. Soc. for. Franche-Comté* 29 (4), 1956 (217–22). [F.]

Discusses an article by M. Simak on the alternation of Spruce and Silver Fir [see *F.A.* 14 No. 189], reviews other opinions on the subject, and concludes that one of the principal factors is the difference in germination capacity of the two species.

182.4. Layer Communities

See also Nos. 1243, 1433–5.

1405. HÖFLER, K. Zur Pilzvegetation aufgeforsteter Fichtenwälder. **[The fungus flora of artificial Spruce forests [in Bavaria].]** *Sydowia, Annales Mycologici Ser. II, Horn* 9 (1/6), 1955 (246–55). 24 refs. [G.] L.S.

182.5. Synecological Measurements and Methods

See also Nos. 1447–8.

1406. VYSOCKIĬ, K. K. Opyt ispoljzovanija massovogo lesoustroiteljnogo materiala dlja vyjavlenija obščih zakonomernosteĭ rasselenija lesoobrazujuščih porod. **[An experiment in the use of extensive working-plan data to reveal general regularities in the distribution of forest-forming species.]** *Bot. Ž.* 41 (5), 1956 (713–8). 6 refs. [Russ.]

Reports briefly on a statistical analysis of ca. 1000 stand descriptions made in the Tul'skie Zaseki, illustrating particularly the correlation of specific composition with altitude and moisture in mixed hardwoods (chiefly Lime, Oak, Ash, Maple and Elm).

187. Vegetation Types

See also Nos. 1222, 1238–41, 1244–5, 1248, 1402, 2348.

1407. POGREBNJAK, P. S. Osnovy lesnoĭ tipologii. **[The foundations of the science of forest types.]** Institut Lesovodstva, Akademija Nauk Ukrainskoĭ SSR, Kiev. 2nd ed. (rev.) 1955. pp. 456 + 2 folding tbls. 9 pp. of refs. [Russ.] Price *Roubles* 23·50.

About two-thirds of this work is devoted to an exposition, based almost entirely on Russian literature, of the foundations of comparative forest ecology (site factors and their interaction; competition, succession and alternation of species in natural forests; classification of forest types and of site conditions; forest 'typology' and its applications in productive forestry). The arrangement in each chapter is mainly chronological, reflecting the development of the subject and leading up to the author's and some subsequent classifications [cf. *F.A.* 12 No. 158, p. 257; 17 No. 3751], with critical discussion of the different approaches. The remainder of the book describes the chief Russian forest types according to the author's system which, though making use of the vegetation and especially of indicator species, lays emphasis on site rather than plant sociology and employs Russian names, derived from vernacular usage, for the types. The 4 main groups (each subdivided into soil-moisture classes) are classified by the nutrient status of the soil as (*A*) very poor ('*bor*'), (*B*) relatively poor ('*suborj*'), (*C*) relatively rich ('*složnaja suborj*' or '*sugrudok*') and (*D*) rich ('*grud*', '*dubrava*', '*ramenj*'

etc.). In addition, (*E*) floodplain forests constitute a separate main group. Appendices give the ecological characters of the chief tree species and a list of indicator plants.

1408. Vorobjev, D. V. Tipy lesov Evropeĭskoĭ časti SSSR. [**Forest types of the European part of the U.S.S.R.**] Institut Lesovodstva, Akademija Nauk Ukrainskoĭ SSR, Kiev. 1953. pp. 452. 9 pp. of refs. [Russ.] Price *Roubles* 21.

A comprehensive descriptive work, of the Pogrebnjak school [see preceding abstract]. After introductory chapters on the principles of classification, the main part gives a key to the forest types, followed by descriptions (with notes on silvicultural features and treatment, where information was available) of the individual types recognized. The final section includes an annotated list of indicator plants (arranged under their scientific names), and a list in which these same species (under their Russian names) are arranged in ecological groups. There is an index to scientific and Russian names.

1409. Pjjavčenko, N. I. K poznaniju prirody grjadovo-močežinnyh bolotnyh kompleksov Kareljskogo tipa. [**Hummock-and-hollow bog complexes of the Karelian type.**] *Trud. Inst. Les.* No. 13, 1953 (130–47). 16 refs. [Russ.]

A description of the origin and development of the hummock-and-hollow bog complexes of N. Karelia, based on observations and pollen analysis. Details are given of the ground vegetation and its successional trends. These bogs bear scattered trees of Birch and Pine; some notes are included on the growth of the latter.

1410. Largin, I. F. Issledovanie drevesnogo jarusa na verhovyh bolotah. [**An investigation of the tree layer on raised bogs.**] *Trud. Inst. Les.* No. 13, 1953 (96–115). 10 refs. [Russ.]

Gives the results of studies carried out in the Leningrad, Velikie Luki, Vladimir and Kalinin regions on the growth of the Pine on hummock-and-hollow, Pine/sphagnum and Pine/dwarf-shrub bogs. Data are presented on mean diameter at moss-bed level, the relation of diam. to height and of diam. at moss-bed level to d.b.h., and root systems.

1411. Pjjavčenko, N. I. Zorinskie bolota Kurskoĭ oblasti. [**The Zorinsk bogs in Kursk province.**] *Trud. Inst. Les.* No. 13, 1953 (158–75). 8 refs. [Russ.]

Describes the vegetation and gives results of pollen analyses.

1412. Nikonov, M. N. Torfjaniki sredneĭ Pečory. [**Peat-bogs of the middle Pechora.**] *Trud. Inst. Les.* No. 13, 1953 (148–57). 7 refs. [Russ.]

Gives data on the formation and types of bogs along the middle Pechora river. Tree growth is rare, and where it does occur the trees are stunted.

1413. Temnoev, N. I. O prostranstvennom raspredelenii rastiteljnosti Kanino-Timanskoĭ tundry i Mezenskih lesov. [**The spatial distribution of vegetation in the Kanin-Timan tundra and Mezen forests.**] *Bot. Ž.* 41 (5), 1956 (689–96). 36 refs. [Russ.]

Gives the % areas of 5 geobotanical regions; subarctic tundra and tundra shrubs; hummock bogs; hummock bogs with islands of forest and open woodland; open woodland, forest and forest bogs; and the northern taiga. Of these, the first two belong to the tundra zone, and the second two to the forest-tundra. The % areas occupied by various vegetation types within the 5 regions are also tabulated.

1414. Tihomirov, B. A., and Štepa, V. S. K harakteristike lesnyh forpostov v nizovjjah r. Leny. [**Forest outposts on the lowlands of the Lena river.**] *Bot. Ž.* 41 (8), 1956 (1107–22). 13 refs. [Russ.]

Describes some observations made on tundra sites with scattered trees at and near Tit-Ary (72° N. lat.). *Larix dahurica* occurs, where it has not been cut, on the terraces and ridges. It appears to be extending its range, through an *Alnus fruticosa* stage, into the tundra, a process which could be hastened by measures to encourage regeneration.

1415. Passarge, H. Die Wälder des Oberspreewaldes. [**Forests of the Upper Spree.**] *Arch. Forstw.* 5 (1/2), 1956 (46–95). 35 refs. [G.]

Describes in detail 200 sq. km. of water meadows reverting to scrub and forest, in the flood-plain of the Upper Spree and its raised margins [cf. *F.A.* 16 No. 2795]. Site factors, history, natural forest associations, succession and recommended silviculture are covered. A constancy table summarizes data of 153 pure Alder swamp forests in Germany; about 50% of the area under study consists of Alder swamp rich in Ash. Successions are distinguished of *Salix cinerea* to Alder swamp; *S. alba* to Ash/mixed forest; and *S. viminalis* to *Quercus robur*/Ash. The higher margins carry Oak/Birch, Pine/Oak and Pine associations.

1416. Lemée, G., and Carbiener, R. La végétation et les sols des volcans de la chaîne des Puys. [**The vegetation and the volcanic soils of the Puys d'Auvergne.**] *Bull. Soc. bot. France* 103 (Spec. No.) 1956 (7–29). 7 refs. [F.f.] O.B.D.

The plant communities of this region can be classed into three groups: (1) grassland, (2) *lande*, and (3) forest communities. Under (3) can be distinguished two associations, (*a*) *Fageto-Scilletum liliohyacinthii* (*Fagetum gallicum*) which is represented in isolated cases by Beech high forest, but more often by degraded Birch or Hazel, and (*b*) *Piceetum montanum*, which has originated from earlier afforestation with Spruce, either pure or mixed with Pine. (1) are climaxes, but (2) are secondary associations resulting from the destruction of the original Beech forest. It should be easy to reconstruct the Beech forest by stages in which Hazel plays an important part. The artificial coniferous stands, on the other hand, are of far greater economic value than the Beech.

1417. Corona, E. ***Pinetum astragalosum* in Val di Sole**? *Monti e Boschi* 7 (9), 1956 (421–4). [It.f.e.]

The author finds two types—*Pinetum astragalosum* and *P. ericosum*—and several transitional forms between them, in this valley of the Trentino.

1418. STOJANOV, N. A. Botaniko-geografičeskiĭ očerk Bolgarii. **[A sketch of the plant geography of Bulgaria.]** *Bot. Ž* 41 (8), 1956 (1123–36). 29 refs. [Russ.]

Includes a list of 8 forest types: (*A*) Pre-glacial:—sclerophyllous Mediterranean; continental forest-steppe (*Ulmetum, Quercetum mixtum*); river and swamp (*Saliceta* and *Alneta*); heliophilous broad-leaved (*Quercetum pubescens, Q. confertae, Q. cerridis, Carpinetum duinensis, C. betuli*); sciophilous lowland (*Fagetum orientalis, Castanetum, Hippocastanetum*); (*B*) Post-diluvial:—sciophilous montane (*Fagetum silvaticae, Abietum albae*); heliophilous (*Quercetum sessiliflorae*); subalpine coniferous.

1419. PAŞCOVSCHI, S., LEANDRU, V., and RĂDULESCU, A. Tipurile de pădure din silvostepa dintre Ialomiţa şi Dunăre. **[Forest types of the forest steppe between the Ialomiţa and Danube.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 8 (1), 1956 (179–97). 8 refs. [Rum.rum.russ.f.] O.R.S.

The predominant species are Oaks (*Quercus pedunculiflora, Q. pubescens, Q. cerris* and *Q. frainetto*) pure or in mixture. The authors distinguish 12 distinct types.

1420. QUÉZEL, P. Contributions à l'étude des forêts de chênes à feuilles caduques d'Algérie. **[A study of the deciduous Oak forests of Algeria.]** *Publ. Serv. For. Algér.* No. 1, 1956. pp. 57 + 8 photos. 22 refs. [F.]

The only deciduous Oaks of Algeria are *Quercus afares* and the extremely plastic *Q. faginea*. Tables are given of 3 associations of the latter, one of *Abies numidica*, and one of mixed Oaks, and their bioclimate, floristics, and biogeography are discussed. The area studied lies in the coastal mountains up to 2000 m. A map of the associations and sub-associations of the Petite Kabyle is included.

1421. JACKSON, J. K. **The vegetation of the Imatong Mountains, Sudan.** *J. Ecol.* 44 (2), 1956 (341–74). 32 refs.

The topography, climate and soils are described, and the main biotic influences on the vegetation discussed. The vegetation of the various altitudinal zones is described and the succession from fire-climax grassland to the climax vegetation is outlined for each zone. On the analogy of successions observed in the Imatong Mts., it is suggested that some of the characteristic plant communities described from East Africa, in particular the *Hagenia/Hypericum* zone, may be seral stages produced by human interference with the vegetation.

1422. RICHARDS, P. W. **Study of tropical vegetation with special reference to British Guiana and British West Africa.** *Unasylva* 10 (4), 1956 (161–5). 9 refs.

A paper read at a UNESCO symposium on the study of tropical vegetation (Ceylon, March 1956). The problems of classifying and naming tropical vegetation are illustrated from two humid tropical regions—British Guiana and British West Africa.

1423. GERMAIN, R., and EVRARD, C. Étude écologique et phyto-sociologique de la forêt à *Brachystegia laurentii*. **[An ecological and plant-sociological study of *B. laurentii* forest.]** *Publ. Inst. nat. Étude agron. Congo belge* (*Sér. sci.*) No. 67, 1956. pp. 105. 58 refs. Price *Fr.*90.

A detailed monograph covering floristics, synecology, microclimate and soils, with a profile diagram and species tables and index. This forest is a climax association placed in the *Gilbertiodendretalia dewevrei* of the evergreen rain forests of the central Congo Basin. It has broken distribution of small stands on plateaux from Yangambi to Lake Leopold II. *B. laurentii* is dominant in all strata.

1424. EDWARDS, D. C. **The ecological regions of Kenya: their classification in relation to agricultural development.** *Emp. J. exp. Agric.* 24 (94), 1956 (89–108 + 6 plates). 20 refs. O.R.E.

Describes and illustrates 6 main vegetation types: highland grassland and forest; scattered tree grassland (*Combretum/Hyparrhenia*); coastal high-grass/bush; scattered tree grassland (*Acacia/Themeda*) and open grassland; desert grass/bush (*Commiphora/Acacia*); desert grass and desert scrub; discusses their characteristic species, distribution, climatic and soil conditions, and their reaction to agricultural use.

1425. STOFFERS, A. L. **Studies on the flora of Curaçao and other Caribbean Islands. Volume I. The vegetation of the Netherlands Antilles.** *Publications of the Foundation for Scientific Research in Surinam and the Netherlands Antilles, Utrecht* No. 15, 1956. pp. 142 + 28 plates, 4 maps. 106 refs. [E.] Price *Fl.*12.

The Windward and Leeward groups are described separately under the following headings: environmental factors; flora; description of the regions investigated; and description of communities.

1426. LINDEMAN, J. C., and MOOLENAAR, S. P. Voorlopig overzicht van de bostypen in het noordelijk deel van Suriname. **[Preliminary survey of the forest types in the northern part of Surinam.]** Dienst 's Lands Bosbeheer, Paramaribo. 1955. pp. 55 + 2 sets of drawings, 1 map. 17 refs. [Du.]

Includes descriptions of the main types within the wider classification of wet types, dry types and rain forest, a map showing the distribution of the various types, their vegetation profiles, and lists of plants with native and scientific names.

1427. BONDAR, G. Problemas florestais da Bahia. **[Forest problems of Bahia.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 8, 1955 (162–76). [Port.e.]

Official figures for forest areas in the state of Bahia are 192,354 sq. km. of high forest (36% of the total area of the state), and 62,383 of low forest (11% of the total area). The forest types may be classed as follows: (1) Littoral forests of the extreme south, on sterile siliceous soils, unsuitable for grazing and agriculture; (2) littoral forests on better soils, usually granitic, partially suitable for agriculture; (3) forests in the interior of the state on soils of sedimentary origin, mainly calcareous, but also partially granitic, with moderate to heavy rainfalls, but less than in the littoral zones; (4) *caatinga* (low forest on fertile soils, but lacking regular rainfall) and *tabuleiros* (also low forest on siliceous formations, usually flat, with poor soils unsuitable for

large-scale agriculture), and (5) *serrados*, *gerais* and *campos* which have in common an acid soil, essentially siliceous, an impermeable subsoil, and abundant rainfall. The *serrados* and *campos* are characterized by Cyperaceae and Gramineae, and shrubby vegetation. In the *serras*, trees predominate with *Mauritia vinifera* on the Barreiras plateau. Recommendations are made as to species suitable for afforestation in these regions. On the whole, species yielding edible fruits, oil, rubber etc., such as *Aleurites moluccana*, *Carapa guianensis*, *Hevea brasiliensis*, *Joannesia princeps*, *Ficus* spp., *Bombax* spp. and Eucalypts are recommended as bringing the greatest economic returns.

1428. SCHMITHÜSEN, J. Die räumliche Ordnung der chilenischen Vegetation. **[The regional distribution of vegetation in Chile.]** *Bonner Geographische Abhandlungen*, *Bonn* No. 17, 1956 (1–86, 184–6). 62 refs. [G.span.]

1429. TORTORELLI, L. A. La lucha por la vida en los bosques argentinos. **[The struggle for life in the Argentine forests.]** *Natura*, *Buenos Aires* 1 (1), 1954 (5–19 + 29 photos). [Span.]

Observations on the sub-antarctic forests of Tierra del Fuego and the sub-tropical Misiones forests, and on the competition between species in these forests.

1430. PERFUMO, L. R. Bosques higrofíticos de la provincia de Formosa—características biológicas de algunas de sus especies componentes. **[The hygrophilous forests of the province of Formosa—biological characteristics of some of its component species.]** *Publ. Misc. Adm. nac. Bosques*, *B. Aires* No. 41, 1956. pp. 13. [Span.]

Figures from sample plots in the west-central district of the humid zone of Formosa province show that, in mature forest, conditions favour the regeneration and growth of *Patagonula americana*, *Ruprechtia polystachya*, *Phyllostylon rhamnoides*, and *Diplokeleba floribunda* at the expense of tannin-producing species. The present method of 'selective' felling (1) helps to maintain these species in the position of dominance that seems to typify the climax of this forest, (2) hinders the regeneration and development of the light-demanding species Lapacho [*Tabebuia* sp.], Espina Corona [*Gleditsia amorphoides*], and of Urunday [*Astronium balansae*], already inhibited by the close formation of this type of forest,and (3) reduces the already low representation of Quebracho Colorado [*Schinopsis* spp.] and Guayacán [*Caesalpinia melanocarpa*?].

1431. MORELLO, J. Estudios botánicos en las regiones áridas de la Argentina. I, II. **[Botanical studies in the arid regions of Argentina. I and II.]** *Revista agronómica del Noroeste argentino*, *Tucumán* 1 (3), 1955 (301–70; 385–524 + 20 plates). Many refs. [Span.e.] C.G.B.

The ecological region of Argentina known as *monte* extends from N. to S. over a range of ca. 2200 km. from near-tropical latitudes to ca. 44° 20′ S. A study is presented of 4 species common to the region—*Larrea cuneifolia*, *L. divaricata*, *L. nitida* and *Zuccagnia punctata*. Part I deals with habitat, morphology and anatomy, and Part II with transpiration.

1432. MAYCOCK, P. F. **Composition of an upland conifer community in Ontario.** *Ecology* 37 (4), 1956 (846–8). 6 refs.

A general review of geographical location, topography, climate, soils, geology, and past history of the Algonquin Region indicates the importance of these factors in the establishment of the coniferous community under consideration. Logging and burning, Spruce-budworm outbreaks, and invasion by a group of highly competitive herbaceous species are largely responsible for the appearance at present. Various members of this forest type are very similar physiognomically and the data indicate that the same group of tree species; White Spruce, White Pine, and Balsam Fir, constitute the main dominants, though not always in the same sequence of importance. The existing reproduction indicates a continuation of this dominance. *From author's summary.*

1433. CORMACK, R. G. H. **Spruce-Fir climax vegetation in south-western Alberta.** *For. Chron.* 32 (3), 1956 (346–9). 8 refs.

Describes further the ground vegetation of Spruce/Fir climax stands [cf. *F.A.* 15 No. 1203]. A small number of 'key' plants is shown to be correlated with mature Spruce and Fir and to delimit sharply this climax stage of coniferous forest from all earlier stages. The stability of Spruce/Fir stands is briefly discussed. *From author's abstract.*

1434. OOSTING, H. J., and BOURDEAU, P. F. **Virgin Hemlock forest segregates in the Joyce Kilmer Memorial forest of western North Carolina.** *Bot. Gaz.* 117 (4), 1956 (340–59). 8 refs. O.B.D.

Two segregates are distinguished: (1) characterized by dense undergrowth of *Rhododendron* sp. and a sparse herb layer, and (2) having a very open shrub stratum but a fairly dense and diversified herb layer. Data are presented on the composition and constitution of these two types of virgin Hemlock (*Tsuga canadensis*) stands.

1435. BECKING, R. W. Die natürlichen Douglasien-Waldgesellschaften Washingtons und Oregons. **[The natural Douglas Fir forest plant communities of Washington and Oregon.]** *Allg. Forst- u. Jagdztg.* 127 (2/3), 1956 (42–56). 13 refs. [G.e.]

A paper based on the author's thesis [cf. *F.A.* 16 No. 1359]. Plant-sociological data from 325 sample plots 20 × 20 m. square take in the main Green Douglas Fir region between 44 and 49° lat. and 121 and 125° long.; this is divided into 7 sub-regions, climatic data, site indexes and data on soil profiles being analysed and compared, and the natural succession traced. A *Polysticho-Pseudotsugion* (dominant species, *Polystichum munitum*) and a *Gaultherio-Pseudotsugion* (dominant species *Gaultheria shallon*) and various subdivisions of each are distinguished. The first named is generally associated with better sites. Indicator plants for site quality are discussed.

2. SILVICULTURE

See also No. 1354.

1436. **Poplar planting.** *Leafl. For. Comm., Lond.* No. 27, 1956. pp. 18. Price 1*s.* 3*d.*

Gives a brief outline of the cultivation, diseases and pests, and utilization of Poplar in Great Britain.

1437. **[Afforestation work in Burgenland [Austria].]** *Unasylva* 10 (3), 1956 (144–5).

A report dealing chiefly with the use of *Ailanthus altissima* in shelterbelts 30–50 m. wide, together with Robinia and Maple, and the methods used in raising it from seed and transplanting, including the use of a special machine for lifting to avoid damage to the very large taproot. Soil and climatic requirements are also discussed.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 1447, 1457, 1461, 1465, 1585, 1750, 2004–5.

1438. LEZAMA MICHEL, R. Proyección del método silvícola de tratamiento para explotación de montes altos e irregulares denominado 'de fajas alternas con aprovechamiento de sujetos maduros y supermaduros'. **[Plan of a method of silvicultural treatment for the exploitation of uneven-aged high forest, called the method of 'alternate strips with exploitation of mature and overmature trees'.]** *Mensajero for., Durango* No. 135, 1955 (8–10). [Span.]

Outlines a method whereby stands would be divided into belts 500–2000 m. wide by cleared strips 5–7 m. wide. Alternate belts would be felled in succession, only the mature and overmature trees being taken, the remaining belts being exploited after a lapse of < 5 years.

1439. JEFFREY, W. W. **Swiss femel-coupe working.** *Bull. For. Dep. Univ. Edinb.* No. 2, 1956. pp. 20. 8 refs.

Aims at giving a detailed but simple account of the Swiss *Femelschlag* system, including some account of those points upon which opinion is still divided.

1440. CURTIS, J. D. **A study of Ponderosa Pine production.** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 4, 1955. pp. 9 + 1 dgm. 5 refs.

Describes the laying out of an experiment designed to answer the most urgent problems of Ponderosa Pine management, using single-stem and group-selection markings, two levels of residual stand volume and two practicable extremes of logging tractor, all on 3 levels of growing-stock volume.

1441. ROTH, G. Die Plenterwaldfrage in Ungarn. **[The problem of selection forest in Hungary.]** *Schweiz. Z. Forstw.* 107 (12), 1956 (762–6). 1 ref. [G.]

Describes the author's propaganda for the selection principle against local prejudice, and the successful establishment of selection forest near Sopron, Budapest [cf. *F.A.* 15 No. 4423] and elsewhere, and also traditional selection forests existing in some parts of the country.

1442. FRÖHLICH, J. Bestandes-Aufnahme im Plenterwald. **[Inventory of a selection forest.]** *Allg. Forstztg.* 66 (1/2), 1955 (4–5). [G.]

Tabulates data on stocking, composition etc. of two fully enumerated small areas (4 and 11 ha.) in the Alpine foothills near Gmunden. Where volume/ha. is ca. 250 cu.m., the whole forest floor is covered with young growth of Beech, Silver Fir, and Spruce, against only ca. 70% where volume is 330 cu.m./ha. The author favours group mixtures in order to produce straight clear boles.

1443. HART, A. C. **Changes after partial cutting of a Spruce/Fir stand in Maine.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 86, 1956. pp. 8. 1 ref.

A partial-felling experiment was set up in 1945 on 20·6 acres in which Balsam Fir predominated. Mature Balsam and defective, and poor-vigour Balsam, Red Spruce and White Spruce were removed. Vulnerability of the stand to the Spruce budworm was calculated before and after felling, and it decreased greatly as the % of Balsam decreased. As non-merchantable species were not removed, their % in the stand will increase, and yields decline, unless counter-measures are taken. After 7 years it was found that mortality of residual Balsam was heavy and short felling cycles are necessary to salvage the dead trees.

1444. BOE, K. N., and TACKLE, D. **Board-foot increment on residual Ponderosa Pine in Montana.** *Res. Note Intermt. For. Range Exp. Sta.* No. 34, 1956. pp. 8. 4 refs.

Three plots of 4–7 acres in a 100-year stand of *P. ponderosa* (site index 70) were subjected in 1932 to different felling treatments leaving (*a*) 2000, (*b*) 4000 and (*c*) 10,000 bd. ft./acre. Volume losses in the first 5 years offset increment and were 3 times as high in (*c*), owing to insect attack, as in (*a*) or (*b*). Net annual increment after 20 years was higher in (*c*), with 175 bd.ft./acre, than in (*b*), with 116, but individual trees in (*b*) showed more growth in bd. ft. Recommendations for partial felling in similar stands include: leaving a reserve of 4000–8000 bd. ft. per acre and better disposal of slash to lessen mortality from insect attack.

222. Coppice, Pollarding and Lopping Systems

1445. COINTAT, M. Étude statistique sur les taillis-sous-futaie communaux du département de la Haute-Marne (Inspection de Joinville). **[A statistical study of the communal coppice-with-standards of the department of Haute Marne (Joinville forest district).]** *Rev. for. franç.* 8 (10), 1956 (658–75 + 3 photos). 7 refs. [F.]

Gives data on increment and production by species, types of product etc. and discusses the future

management of these woodlands in the light of reduced demand for charcoal, fuelwood etc.

1446. COINTAT, M. Évolution des taillis sous futaie communaux du département de la Haute-Marne de 1895 à 1950 (Inspection de Joinville). **[Development of communal coppice-with-standards of the Department of Haute Marne (Joinville forest district) from 1895 to 1950.]** *Rev. for. franç.* 8 (12), 1956 (834–49). 3 refs.

Includes data for 2 coppice rotations on species distribution, number of trees/ha., proportion of standards of different ages, production on different types of soil, and changes in assortments harvested. The standing volume of the reserve has risen by 39%, yield of sawtimber by 112%, and small wood by 13%, while the quantity of charcoal wood has diminished by 20% during the 55 years under consideration. In general, rotations of both coppice and standards are lengthening.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 1601–5, 1939, 1945.

1447. KÖSTLER, J. N. Der Bestockungsaufbau in der waldbaulichen Bestandesdiagnose. **[Stand structure as a means of silvicultural stand assessments.]** *Allg. Forstztg.* 66 (5/6), 1955 (49–55). 22 refs. [G.]

To illustrate his methods of stand analysis and assessment, the author discusses 5 German or Austrian mixed selection forests, evaluates their composition and the development trends to be deduced therefrom, illustrated by stand profiles and crown projections of representative strips, along with tables showing diameter classes, b.a., volumes and crown characteristics by species, with particular reference to Silver Fir and Larch.

1448. DRĂGUȚ, N. O metoda de reprezentare grafică și schematică a indicilor pădurii. **[A graphic and schematic method of representing forest types.]** *Rev. Pădurilor* 70 (8), 1955 (336–9). [Rum.russ.]

Describes a method of representing stand structure, stand composition, regeneration capacity, and composition of ground flora by a combination of graphic plotting and symbols. Two examples are given—terrace Oak wood and an Oak/Pine wood showing the development of Oak in relation to Pine.

1449. RĂDULESCU, M. Pentru sporirea procentului de rășinoasa în pădurile de fag cu rășinoase. **[How to increase the proportion of conifers in mixed Beech/conifer forest.]** *Rev. Pădurilor* 70 (12), 1955 (590–4). [Rum.]

Examines a number of Rumanian examples of mixtures of Beech with Spruce, Silver Fir, Pine or Larch, and their regeneration after selective logging, and makes suggestions for increasing the % of conifers by silvicultural treatment or by planting.

1450. **Bamanpokri Teak plantations, Kurseong Division.** Forest Department W. Bengal, Calcutta. [1955?]. pp. 10 + 3 photos.

Gives an account of the establishment, performance, growth data etc., of mixed plantations of Teak with Sal and other species, established 1868–88, and of a new series started in 1941.

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 1393, 1617, 1736, 1765, 1768–9, 1772, 1874.

1451. **California forest regeneration problems.** Division of Forestry, Department of Natural Resources, California. 1955. pp. 45. 41 refs.

A survey of the subject by an *ad hoc* forest regeneration committee for the State Board of Forestry. Priority studies concern (1) optimum regeneration density, (2) moisture conservation in regeneration areas during the summer drought, (3) rodent control (for seed crop) after logging, (4) control of species composition.

1452. STRAND, L. Resultat av planting, såing og naturlig foryngelse på en eldre brannflate. **[Results of planting, sowing and natural regeneration on an old burnt area.]** *Tidsskr. Skogbr.* 64 (3), 1956 (177–80). 2 refs. [Nor.]

Of 500 dekares burnt in 1918, part was planted with Pine 1–2 years after, part was sown rather later, and part was left; this last is now covered with natural vegetation, mostly Pine. Plots were laid out and measurements made in 1954. Growth (volume/ha., height and b.a.) had been much greater in the planted than in the sown or naturally regenerated areas. Trees in the planted areas are 6–7 years older than the others, but the difference in growth is probably related to the loss in plant nutrients in the years between the fire and establishment of seedlings, rather than directly to the difference in age.

1453. SINGH, A. **[Natural regeneration of *Larix griffithii*.]** *Indian For.* 82 (10), 1956 (542).

Young crops of Silver Fir (*Abies spectabilis*), Spruce (*Picea spinulosa*) and *Tsuga dumosa*, at 10,000 ft. alt. in Sikkim State, were destroyed by the floods of 1947 and 1950 over a large area which was then covered with deposits of silt. This is now almost covered with natural regeneration of Larch (*L. griffithii*), the seed source being trees some 1500 yards away on the other side of a stream. The sapling Larch have already begun to seed profusely; one sapling 3 ft. 9 in. high in 1956 bore 334 cones of normal size.

1454. SMITH, J. H. G. **Some factors affecting reproduction of Engelmann Spruce and Alpine Fir.** *Tech. Publ. B.C. For. Serv.* No. *T.*43, 1955. pp. 43. 37 refs. Price 50 cents.

Preliminary surveys made before and after logging in the Spruce/Fir forests at Bolean Lake, southern British Columbia, showed advance growth of *Picea engelmannii* to be poor compared with that of *Abies lasiocarpa* because its germination was confined to mineral soils, burnt patches and rotten wood, and extensive damage , was caused by *Choristoneura*

fumiferana and by decay. *A. lasiocarpa*, moreover, could establish itself on moss and litter because of greater initial root penetration and hypocotyl growth. Field tests were carried out in 1953, sowing 100 seeds each of both species in 5 types of seedbed on 2 site types. Spruce germination and growth was best on mineral soils (i.e. where the surface layer of organic material had been removed) and rotten wood, and least on moss and litter. Mortality was highest on burned surfaces. Rodent damage was severe. Scarifying the soil with bulldozers produced excellent seedbeds at reasonable cost; controlled burning proved ineffective and expensive.

1455. VINCENT, A. B. **Balsam Fir and White Spruce reproduction on the Green River watershed.** *Tech. Note For. Br. Can.* No. 40, 1956. pp. 24. 17 refs.

Summarizes and discusses the findings of a number of studies of reproduction on cut-over areas in the Green River watershed of New Brunswick, carried out by the Forestry Branch since 1944 [cf. *F.A.* 16 Nos. 454, 613; 17 Nos. 713, 1881]. The most important factors affecting the condition of reproduction of *Abies balsamea* and *Picea glauca* include: (1) density, age and composition of the original stand; (2) suppression by *Acer spicatum* in cut-over mixed woods; (3) discouragement of regeneration and smothering of advance reproduction by slash piles; (4) destruction of advance growth during logging; (5) site factors; (6) effects of sun and frost in preventing establishment of Spruce and Fir. Recommendations for encouraging Spruce and Fir regeneration include release from shrubs, care to avoid unnecessary logging damage, lopping and scattering of slash. If planting is done on logging roads it should be done not later than one growing season after logging, using planting stock at least 8 in. high.

1456. MARTIN, J. L. **An ecological survey of burned-over forest land in southwestern Nova Scotia.** *For. Chron.* 32 (3), 1956 (313–36). 16 refs.

A study was made of 8 burns (1, 2, 6, 9, 10, 20, 29, and 40 years old respectively), in order to determine existing conditions of vegetation, soil cover etc. The results show that repeated heavy cuttings and light fires, in coniferous forests on the poorer soils, encourage invasion by ericaceous plants, and seriously reduce the capacity of the sites for natural regeneration of tree species.

1457. BERRY, A. B., and FARRAR, J. L. **Reproduction and growth in cut-over Black Spruce swamps at the Petawawa Forest Experiment Station.** *Tech. Note For. Br. Can.* No. 42, 1956. pp. 8. 6 refs.

An experiment was initiated in 1936 to test the effect on the reproduction and residual stand of *Picea mariana* of two methods of slash disposal in conjunction with clear and partial cutting. Examination of the plots in 1953 showed that adequate reproduction occurred after felling of small swamps of mature Black Spruce, regardless of method of cutting or slash disposal. Partial cutting in which $\geqslant 60\%$ of original volume was removed resulted in considerable mortality in the residual stand; clear cutting is therefore preferable.

1458. MAKI, T. E., and SLOCUM, G. K. **Put Pines in the Piedmont.** *Research & Farming, Raleigh, N.C.* 15 (1), 1956 (10–1). I.M.I.

Dozing and root-rake treatment of the soil after logging all marketable trees gave better survival of Pine seedlings on a former hardwood site than broadcast burning. In both cases it is necessary to release the Pines from sprouting hardwoods about the end of their third year.

1459. GORDON, D. T. **Slash disposal and seedbed preparation by tractor.** *J. For.* 54 (11), 1956 (771–3). 4 refs.

[Cf. *F.A.* 13 No. 3733.] Describes the methods and equipment used on the Blacks Mountain and Stanislaus National Forests, California. Tables show the time and cost required for 1952–55 on the Blacks Mt. and 1948–49 in the Stanislaus Forest.

1460. CROSSLEY, D. I. **Effect of crown cover and slash density on the release of seed from slash-borne Lodgepole Pine cones.** *Tech. Note For. Br. Can.* No. 41, 1956. pp. 51. 8 refs.

The field study was divided into two phases: (1) a fundamental study of comparative cone-tissue temperatures reached throughout the day, under maximum conditions of solar radiation, by cones situated at various levels above the ground; (2) an applied study of the behaviour of slash-borne cones in relation to seed release. The study was made in an 85-year Lodgepole stand at Strachan, Alberta, at ca. 3500 ft. altitude. The literature is reviewed and the methods employed are described in detail. In general it was found that the rosin bond in the cones ruptured and the scales flexed the more rapidly, the nearer the cone was to the surface of the ground. If advantage is to be taken of the earth's radiating surface to effect cone opening, slash should be so placed that as many cones as possible are situated $< 6{\cdot}5$ in. above the surface. A black radiating surface such as the forest floor after fire was more effective than either a reddish-brown mineral soil or the undisturbed litter, in increasing the temperature of cones 3 in. above, but the differences were not great. Under the climatic conditions during the 2 years of the study, the greatest amount of seed was shed during the first summer and was available for germination on the forest floor in the following spring. Seedfall in the second season was considerably less, and it is probable that further addition of seed in subsequent years would be negligible. Age of cone appears to bear little relation to opening: at the end of the first summer, 51% of the 1- to 4-year-old cones had opened and 56% of cones $>$ 10 years old. The more overhead shade is provided by the residual stand, the closer must the cone-bearing slash be lopped if sufficient seed is to be released to result in any chosen degree of regeneration stocking. *From author's summary.*

1461. THIRGOOD, J. V. **[Effect of strip felling on the natural regeneration of *Pinus brutia* in Cyprus.]** *Rep. For. Dep. Cyprus 1955*, 1956 (59–60).

In 1950–51 an experiment was laid down to test the suitability of strip felling for the regeneration of *P. brutia*. A strip 150 ft. wide and 3000 ft. long was clear-felled along the contour near the top of a

well stocked slope at 3000 ft. alt. General aspect was west; 475 trees were removed, producing 8000 cu. ft. of round timber. Some plots extending the full width of the strip were demarcated, cultivated and sown. The progress of regeneration during the 5-year period, although slow, has proceeded steadily. The pattern of height distribution suggests that germination and seedling establishment have continued throughout the period and are still continuing despite quite considerable seedling loss. There is, however, evidence of unequal distribution across the strip. Seedlings are less frequent towards the upper edge, the greatest concentration is found towards the centre, and there is a slight fall-off towards the lower margin. No noticeable erosion has resulted from the clear felling.

1462. WITTICH, W. Die standörtlichen Bedingungen für die natürliche Verjüngung der Kiefer und für ihre Erziehung unter Schirm. **[Site requirements for natural regeneration of Pine and for raising Pine under cover.]** *Allg. Forst- u. Jadztg.* 126 (5/6), 1955 (109–16). 22 refs. [G.g.e.]

A discussion of this controversial problem on the basis of German literature, including 9 papers by the author, stressing the importance of site factors, particularly water supply and ground vegetation.

1463. CONSTANTINESCU, N. Contribuţii la studiul regenerării stejeretelor de pe soluri cu fenomene de înmlăştinare din cîmpiile din vestul şi nord-vestul ţarii. **[The regeneration of Oak woods in the W. and N.W. of Rumania on soils with a tendency to become marshy.]** *Rev. Pădurilor* 71 (3), 1956 (131–6). [Rum.]

When these forests are felled, no natural regeneration of woody species occurs, but a thick growth of *Carex* and *Juncus* spp. Oak regeneration can be obtained only by first draining the area. These stands should be regarded as protection forest and treated accordingly.

1464. KAZARJAN, V. O., and MAHATADZE, L. B. **[Correlations between young Oak shoots in relation to stool size.]** *Doklady Akademii Nauk Armjanskoĭ SSR* 20, 1955 (61–4). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 10 (5), 1956 (157). [G.] P.R.

Investigations on the number and viability of shoots growing from stools (d.b.h. 11–40 cm., age 24–120 years) after felling, showed that, while shoots on the younger stools were no fewer, up to five times as many survived on the older stools. No correlations between the few surviving shoots could be observed. It is important to leave as many shoots as possible on the stool or no equilibrium will be reached between the vegetative mass of the aerial and underground organs.

1465. WENGER, K. F. **Growth of hardwoods after clear-cutting Loblolly Pine.** *Ecology* 37 (4), 1956 (735–42). 12 refs.

A study of the rate of coppice regrowth of *Liquidambar styraciflua*, *Acer rubrum*, *Quercus falcata*, *Cornus florida* and *Myrica cerifera* after clear-cutting *Pinus taeda* with hardwood understorey. The effect of burning was also studied, and the bearing of the findings on Pine regeneration is discussed.

1466. BØRSET, O. Rotskudd hos osp. **[Aspen suckers.]** *Tidsskr. Skogbr.* 64 (4), 1956 (219–40). 15 refs. [Nor.e.]

Two areas examined 1–2 and 5 years after clear felling showed fairly dense sucker regeneration. One with 8·2 residual stumps per dekare had 1800 suckers per dekare, and the other, with 47 stumps, 7000 suckers per dekare. The most densely stocked of the plots, area 4 sq. m., carried suckers corrresponding to 22,000/dekare. A slight but significant correlation was found between number of suckers in a plot and its distance from the nearest stump or the nearest 5 stumps. Most of the suckers sprang from thin roots, diam. 0·5–2 cm.; it is improbable that rot would be carried through such thin roots to the suckers, which are often 10–15 m. from the stump. Most suckers sprang from superficial roots, at a depth of $\leqslant 4$ cm. Height growth of suckers in their early years was good, although top shoots were often damaged by fungus, mainly *Venturia tremulae*. Mean height of 2-year suckers on one plot was 81 cm. The same plot showed slight positive correlations of height with root diameter and root depth. Earlier research in Estonia and the U.S.A. is discussed.

232. Artificial Regeneration

See also Nos. 1451–2.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 1242, 1368, 1379–80, 1427, 1574, 1577, 1581.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

1467. P., J. Un exemple de production du mélèze du Japon en Moyenne Ardenne. **[Yield of *Larix leptolepis* in the central Ardennes.]** *Bull. Soc. for. Belg.* 63 (12), 1956 (531–3). [F.]

Gives figures for intermediate yields and present standing volume for a 70-are plot of Japanese Larch, planted in 1932 with 2-year seedlings at 1·5 × 1·5 m. spacing. It is concluded that the species is well suited to the region, and that thinning should begin early (10–14 years).

1468. LITTLEFIELD, E. W., and ELIASON, E. J. **Report on an experimental plantation of several species of Larch in New York.** *Z. Forstgenet.* 5 (5/6), 1956 (166–9). 12 refs. [E.e.g.f.]

In 1937 an experimental planting was made near Saratoga Springs, N.Y., with 6 Larches, i.e. 3 geographic races of European Larch, Japanese Larch, Dunkeld hybrid and Dahurian Larch (*Larix dahurica*). Data were collected on survival %, height, d.b.h. and form in 1941 and 1953. The Dunkeld hybrid and the Japanese Larch made the most rapid growth both in height and diam., and the Dunkeld showed superior stem form. European Larch of Scottish origin slightly exceeded the Silesian growth rate, and was superior in stem form. European Larch from the Dolomites grew very slowly, as did the Dahurian Larch. These data are

substantiated in some degree by preliminary observations on plantations in other parts of the state, which were established from the same seed stocks. *From authors' summary.*

1469. LENOIR, R. Informations diverses au sujet de *Metasequoia glyptostroboides*. [**Notes on *M. glyptostroboides*.**] *Bull. Soc. for. Belg.* 63 (10), 1956 (434–7). [F.]

Includes notes on specimens in a number of European arboreta and botanical gardens.

1470. FILIPOVICI, J., and ENESCU, V. C. *Pseudotsuga taxifolia* Britt., in bazinul Nădragu (Ocolul silvic Căvăran). [***P. taxifolia* in the Nădragu catchment, Căvăran forest circle.**] *Rev. Pădurilor* 70, (10), 1955 (449–53). [Rum.rum.russ.]

Data are given from a 50-year-old plantation of Douglas Fir in W. Rumania. Stand volume is > 1200 cu.m./ha., c.a.i. > 20 cu.m./ha., height range 36–42 m.

1471. ENESCU, V., and FURNICĂ, H. *Pinus banksiana* Lamb. cultivat in ocolul silvic Stalin. [***P. banksiana* grown in the Stalin forest circle [Transylvania].**] *Rev. Pădurilor* 70 (7), 1955 (329–33). 3 refs. [Rum.]

Describes a plantation made in 1914 near Orasul Stalin at ca. 800 m. alt., mean July temperature 18·3° C., mean January temperature − 3°, summer rainfall 533·8 mm., mean annual r.h. 74%; soil a brown podzol with rooting depth 50 cm. Details are given of the soil profile, a stem analysis and various data on increment, based on measurement in 1954 of 87 trees on a plot 20 × 20 m. D.b.h. varied from 5 to 21 cm. (mean 13·6 cm.), mean height 12·1 m. Height increment culminated at 20 years, and diameter increment at 15. Volume/ha. at 40 years was 226 cu.m.—about equal to European Larch on a similar site and better than Japanese Larch.

1472. CHANDLER, W. G. **Pulpwood plantations in South Africa [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 9, 1955 (16–30).

Describes the Pine (*Pinus pinaster, P. radiata, P. canariensis* and *P. pinea*) plantations in the winter-rainfall region, and Pine (*P. patula, P. caribaea* and *P. hondurensis*) and Eucalypt (*Eucalyptus saligna, E. viminalis, E. cladocalyx, E. grandis, E. radiata* and *E. diversicolor*) plantations in the summer-rainfall region.

1473. STUART, B. E. ST. L. **Muguga arboretum.** *E.A.A.F.R.O. For. tech. Note E. Afr. agric. For. Res. Organ.* No. 4, 1955. pp. 44 + 4. 5 refs.

Gives short notes on, and the early height growth of, 111 mostly exotic species (*Eucalyptus* 32, *Pinus* 21, *Cupressus* 11, *Acacia* 7, *Widdringtonia* 4, and 3 each of *Fraxinus, Callitris* and *Chamaecyparis* etc.), with a supplement on further height growth. The arboretum, near Nairobi, Kenya, has an annual rainfall of 36 in. in 2 rainy seasons; alt. 6800 ft.

1474. PURCELEAN, S. Noi observaţii privind comportarea eucaliptului (*Eucalyptus viminalis* Labill.) în plantaţiile experimentale. [**The behaviour of *E. viminalis* in experimental plantings [in Rumania].**] *Rev. Pădurilor* 70 (9), 1955 (380–2). [Rum.]

Comparison of plantations in several places in Rumania after the very severe winter of 1953–54, showed much greater resistance to low temperatures at Snagov, where the plants (1) had been hardened off by 3 preceding winters of moderate severity, and (2) were protected from the prevailing wind by a shelterbelt of Robinia. It is considered possible to grow *E. viminalis* in Rumania for the production of essential oil.

1475. BASSI, V. Osservazioni e considerazioni sulla coltura dell' eucalitto in alcune zone dell' Italia meridionale. [**Growing Eucalypts in some regions of S. Italy.**] *Monti e Boschi* 7 (10), 1956 (445–57). [It.f.e.]

Notes on nursery practice, planting methods, tending etc. employed by the Terra Apuliae Company in establishing Eucalypt plantations (mainly *E. globulus* and *E. rostrata*) in Apulia.

1476. DIAZ SERRANO, V. Las plantaciones de eucalipto de la Manaja, Minas de Matahambre S.A., Pinar del Río, Cuba. [**The Eucalypt plantations of La Manaja, [established by] the Matahambre Mining Co., Pinar del Río, Cuba.**] *Carib. For.* 16 (3/4), 1955 (55–6). [Span.]

Short notes on methods used and costs in establishing and tending plantations begun in 1949. *Eucalyptus saligna* has made the greatest height growth in 4 years.

1477. LAMB, A. F. A. **Forestry on private estates.** *Journal of the Agricultural Society of Trinidad and Tobago, Port-of-Spain* 55 (2), 1955 (169 . . . 183). L.S.

Discusses the long-term prospects of growing timber trees for profit, combined with, or in substitution for, cocoa, and on sites unsuitable for plantation crops, with information, based on forest department experience, on site requirements, propagation, protection and uses of *Swietenia macrophylla* and *S. mahagoni, Cedrela mexicana, Cordia alliodora, Tabebuia pentaphylla* and *T. pallida, Chlorophora excelsa, Tectona grandis, Pinus caribaea, P. merkusii, Araucaria cunninghamii, A. columnaris, Byrsonima spicata* and *Simaruba amara.*

1478. CHOLLET, A. Le teck au Togo. [**Teak in Togoland.**] *Bois For. Trop.* No. 49, 1956 (9–18). [F.e.span.]

The introduction of Teak dates from 1905; it now covers 4500 ha. and its power of vigorous natural regeneration has resulted in the formation of gallery forest from roadside plantings. Afforestation of savanna, either by *taungya* or by direct planting after grass cutting, is now being undertaken on a large scale. Methods are described in some detail.

1479. MATSUI, Z., ONODERA, S., and YOKOYAMA, C. [**The growing of a Kunugi-Oak stand near Sapporo.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (149–65). 4 refs. [Jap.jap.e.*e.*]

Compares the growth of Kunugi [*Quercus acutissima*] and the climatic data in this area (with a

growing season which is 2 months shorter and has a mean air temperature 4° C. lower) with that of its natural range, giving data from both areas to show that growth is not inferior in Sapporo and that the tree is well worth planting for fuel.

232.12. Races and Provenance Trials

See also section 165 and Nos. 1468, 1498, 1506, 1525, 2321.

1480. EDWARDS, M. V. **The design, layout and control of provenance experiments.** *Z. Forstgenet.* 5 (5/6), 1956 (169–80). 30 refs. [E.e.g.f.]

The objects of provenance (as distinct from 'progeny') trials are discussed and their conduct considered in the seed-collection, nursery and forest stages. Seed collections should be made from whole populations, and they must be very fully described. Full records of collection, seed testing and grading are needed. In the nursery stage, plants must be raised in well designed experiments, and methods of selecting and rejecting plants are described. The principles to be observed in these and other questions of treatment are outlined. In the forest stage, the shape and size of the plot must be that suitable for comparison of crops and not individuals—a principle of general application. It partly determines the size of assessment plot needed. The size and composition of surround required is described, with a figure, the assessment plot plus surround forming the experimental unit of treatment. The combination of such plots into experimental designs should be as simple and robust as possible, and must permit of the significance of differences being determined.

Various methods of spacing, planting, beating-up and thinning, and the principles and precautions needed to determine the methods used, are considered, viz. spacing and planting varying according to site requirements; beating up once only unless special records are kept; and thinning according to normal silviculture but with the use of a stand density index as a special form of assessment of differences.

A final section on assessments concludes that instructions, which are the same in many cases as for other kinds of forest experiments, are best detailed in a separate assessment code. *From author's summary.*

1481. ROBAK, H. Overvintringen av granplanter i planteskolene på Vestlandet: erfaringer fra såningene 1930–1953. **[Overwintering of Spruce in nurseries in Vestland: experiences from sowings in 1930–53.]** *Årsskr. norske Skogplantesk. 1955,* 1956 (57–82). 1 ref. [Nor.e.]

Data are available from a number of nurseries in W. Norway. Before 1948 no difference was apparent between Spruce of Norwegian and of German (Harz Mountains, above 600 m.) provenances as regards 1 + 0, 2 + 0 and 2 + 1 plants, and after 1948 between the two provenances for 2 + 0 and 2 + 1 plants. One-year seedlings of German provenance (mainly Harz, 400–700 m.) showed distinctly poorer survival in the period 1948–54 but this difference is entirely due to the unusually large use of German seed in 1952, a year in which summer temperatures were abnormally low and unusually severe November frosts occurred, causing heavy mortality. Excluding the 1952–53 season, 1-year seedlings of both provenances wintered as well after as before 1948, but 2 + 1 and 2 + 0 plants did rather less well in the second period. Observations from one nursery suggest that the weather may have been less favourable in 1948–54. At this nursery, a fairly high negative correlation was found between seedling (1 + 0) survival and (1) E. and N.E. winds and (2) days without snow cover in Jan.–March, although for older plants any such correlation was slight. The need for further observations on both survival and weather is stressed.

1482. CROW, A. B. **Early effects of geographic seed source of planted Loblolly Pine.** *LSU For. Note La. agric. Exp. Sta.* No. 7, 1956. pp. 2. 2 refs.

At the end of 2 years, there was no discernible difference in seedlings raised from *Pinus taeda* seed from any of a number of sources 20–180 miles from the site of the experiment at Baton Rouge, La.

1483. ROHMEDER, E. Professor Münchs Anbauversuch mit Douglasien verschiedener Herkunft und anderen Nadelbaumarten im Forstamt Kaiserslautern-Ost 1912 bis 1954. **[Münch's trial plantations with Douglas Fir of varying provenances and with other conifers in East Kaiserslautern forest district, 1912–54.]** *Z. Forstgenet.* 5 (5/6), 1956 (142–56). 21 refs. [G.g.e.f.]

A report on experimental plantations of Douglas Fir of 10 different provenances (1 *viridis*, 4 *glauca* and 5 *caesia* forms) and of other conifers for comparison, established by Münch in the Pfälzerwald in 1912. Data are presented on height, diameter, basal area, form, volume increment and disease resistance over the 44 years. The extreme importance of provenance when establishing Douglas is clearly demonstrated. The *viridis* form from Snoqualmie on the Western slopes of the Cascade Mountains has produced in the 44 years a total volume of 739 cu.m./ha., whereas all *glauca* and *caesia* forms, from inland stations, were economic failures. The second best of the provenances, a *glauca* form from Pecos, New Mexico, gave only half the yield of the Snoqualmie provenance. Both the *glauca* and *caesia* forms proved highly susceptible to attack by *Rhabdocline pseudotsugae* and *Phaeocryptopus gäumannii*, whereas the *viridis* form was not affected to the point of economic loss. *From author's summary.*

1484. MÖRMANN. Zum Douglasienanbau in Nordbaden. Feststellungen und Erkenntnisse anlässlich der Douglasienzapfenernte 1953. **[Douglas Fir in North Baden. Information obtained in connexion with the 1953 cone harvest.]** *Allg. Forst- u. Jagdztg.* 127 (5/6), 1956 (97–102). 8 refs. [G.g.e.]

An attempt to trace the provenances of Douglas Firs in the region. Three races (*a*) coastal, to which most of the stands over 50 years belong, (*b*) mountain, chiefly between-wars plantings, and (*c*) intermediate, are distinguished by their cone shapes. The (*a*) provenance has done best. Some cones from marginal trees were deformed by the severe frost of 22 May 1953 and their seeds were empty.

1485. HACKE-OUDEMANS, J. J., and OUDEMANS, T. C. Herkomst van de douglas in Nederland. **[Provenance of Douglas Fir in the Netherlands.]** *Ned. Boschb.-Tijdschr.* 27 (4), 1955 (81–8). [Du.]

Discusses the provenances established in the Netherlands between 1848 and 1877 and gives some recent observations on surviving examples of early introductions of Douglas Fir into Scotland.

1486. DONIȚĂ, N. Despre provenienţa exemplarelor de *Quercus macranthera* F. et M. semnalate in R.P.R. **[The provenance of some specimens of *Q. macranthera* recorded in Rumania.]** *Rev. Pădurilor* 70 (7), 1955 (314–5). 6 refs. [Rum. rum.russ.]

Describes some examples of this species and discusses the possibility of crossing it with *Q. robur*.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

1487. MOFFETT, A. A. **The Black and Green Wattle progeny trials at Sweetwaters.** *Rep. Wattle Res. Inst. S. Afr. 1955/56*, 1956 (30–6).

Tabulates the records of the first replicated progeny trials with these species (14 families of Black and 13 of Green Wattle). The data refer to the first 4½ years, mainly at 6-month intervals and to time of harvest at 11 years. The characters of the parents have not reappeared consistently in their progeny, probably because of the high degree of cross-pollination. In Black Wattle a fairly good estimate of final relative vigour could be made at 2 years. There were positive correlations of bark yield with mean diameter at 2, and with height at 3½ years. In Green Wattle, measurements of young trees proved less reliable for forecasts of yield.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 1578, 1580, 1650–4, 1762 *et seq.*

1488. WOODS, F. W. **Relation of soil moisture and temperature to weed control.** *Proc. 9th ann. Sth. Weed Conf.* 1956 (161–5). O.R.E.

A report on experiments to study the influence of weed clearance on soil moisture and temperatures in the sand-hills of western Florida, where the natural cover is scrub Oak and wiregrass. Four types of plot were established: (1) All vegetation and several inches of topsoil cleared; (2) furrows ploughed, 4 ft. wide and ca. 4 in. deep, and seedlings planted in the centre of the furrows; (3) larger woody stems basal-sprayed, smaller Oaks foliage-sprayed, and a few large trees killed with Ammate; (4) no treatment. The plots were prepared in summer 1952, and Slash Pine seedlings planted in each in January 1953. Soil moisture relations were more favourable for plant growth on the denuded sites than where the native vegetation had been partially cleared or left undisturbed. Survival of the Pine depended to a much greater extent on the availability of soil moisture than on soil temperature; it was poorest on the undisturbed sites, though these had temperatures much more favourable to growth of Pine than the denuded sites.

1489. CRAWFORD, D. B. **Forest ploughing in the south-west of Scotland.** *Scot. For.* 10 (4), 1956 (184–90). 5 refs.

Gives an account of the organization and programme of a firm contracting to do ploughing in connexion with private afforestation in S.W. Scotland, and discusses the advantages, disadvantages and costs, of ploughing as a preparation for planting.

1490. SHIPMAN, R. D. **Furrow old fields to plant Longleaf in the Sandhills.** *Res. Note Stheast. For. Exp. Sta.* No. 98, 1956. pp. 2. 1 ref.

Tests when planting 1 + 0 Longleaf Pine seedlings in furrows 8 in. deep by 24 in. wide, near Aiken, S.C., on old fields with 'rough' aged 7 or 8 years, showed that soil moisture, particularly in the top 3 in. of soil, was greater and dropped below wilting point for shorter periods than on controls. The method has since been applied to 8½ million seedlings on 10,600 acres of old field, with marked superiority in initial survival compared with unfurrowed fields. [Cf. *F.A.* 16 No. 4070.]

1491. SCHWARZ, R. Waldbodensanierung mit maschineller Bodenbearbeitung. **[Forest soil improvement by mechanical preparation.]** *Allg. Forstztg.* 66 (5/6), 1955 (58–60). [G.]

Reports on the use of a bulldozer to remove a 50-cm. layer of raw-humus in strips, leaving the raw humus in heaped ridges as a protection against erosion. This preparation, which makes direct sowing possible, should considerably reduce total regeneration costs compared with plant-hole digging and planting.

232.3. Seed, Nursery Practice, Direct Sowing

See also No. 1619.

232.31. Seed

1492. MESSER, H. Untersuchungen über das Fruchten der europ.Lärche (*Larix decidua* Mill.) **[The fruiting of *L. decidua*.]** *Allg. Forst- u. Jagdztg.* 127 (1), 1956 (8–16). 15 refs. [G.g.e.]

Reports on the seed crop of 65 Larches, ca. 115 years old, of Alpine provenance, from a fairly open mixed stand in the Schlitz district in a moderate seed-year (ca. 30% of full fruiting). Data are presented for mean numbers and weights of cones per tree, mean weight and length of cones, % of empty seed, weight/1000 seeds, relation between cone size and quantity and quality of seed, and the moisture content of seed and cones. The crop represented some 645 kg. cones/ha. at a m.c. of 20% (of fresh weight) and some 30 kg./ha. of seed. Trees were classified according to crown length; the cone crop from crowns > 19 m. long was more than thrice that from crowns 10–14 m. and > 4 times that of crowns < 10 m. long. Cones were abnormally small owing to the dry weather, and the heavier crops consisted of lighter cones. Cone size is therefore not a safe criterion of local races. At a m.c. of 20%, 50 kg. cones yielded 4·104 kg. seed, of which 43·2% by weight were empty. The % of empty seed varied widely and was least in cones from the smaller

crowns. No clear correlation between quantity and quality of seed and part of crown was established, but the % of empty seeds appeared to be greater towards the top. Weights of full and empty seeds overlapped considerably, making separation difficult. The m.c. of cones was greater than that of seeds. In the extraction kiln, the cones were dried to 3·9 and the seed to 3%. Re-absorption of moisture was rapid in the open, slow in a heated room. At m.c.s > 5% the seeds were strongly hygroscopic.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 1492, 1837–9, 1874, 1913, 1926–8.

1493. FOWELLS, H. A., and SCHUBERT, G. H. **Seed crops of forest trees in the Pine region of California.** *Tech. Bull. U.S. Dep. Agric.* No. 1150, 1956. pp. 48. 35 refs.

Cone crops and seed dispersal were observed for 28 years, the species mainly studied being (*a*) *Pinus ponderosa*, (*b*) *P. lambertiana* and (*c*) *Abies concolor*. Nearly all cones were borne on dominant trees and, within the dominant crown class, cone production on (*a*) increased with bole diameter up to ca. 38 in. and then levelled off or declined; in (*b*) cone production continued to rise with increased diameter; the larger trees of (*c*) bore fewer cones than the intermediate sizes because of mistletoe infection and insect or mechanical injury in the crowns. Cone crops occurred irregularly. The interval between heavy crops on (*a*) varied from 1 to 8 years, on (*b*) from 2 to 7 years, and on (*c*) from 3 to 9 years. None of the trees on the plots bore crops every year, but 85% of (*a*), 35% of (*b*) and 9% of (*c*), > 19·5 in. d.b.h. bore cones half the time. Cone crops were much reduced by tree squirrels, birds, and insects. The proportion of sound seed in (*a*) and (*b*) was usually high in good seed-years, ranging from ca. 70% upwards; the proportion in (*c*) was lower, but still good. A strong correlation was found on cut-over areas between the vol./acre in [Dunning?] tree classes 1 and 3 and amount of Pine seed produced.

1494. MAGUIRE, W. P. **Are Ponderosa Pine cone crops predictable?** *J. For.* 54 (11), 1956 (778–9). 1 ref.

In California a 23-year study of the relationship between temperature and the size of cone crops indicated that when the mean monthly temperature for April and May was unusually high, *P. ponderosa* flowered abundantly in the following spring and had a large cone crop in the autumn. With low average temperatures few flowers appeared. The relationship was significant in 20 cases out of 23.

1495. LOTTI, T. **Good seed production from a young stand of Loblolly Pine.** *Res. Note Stheast. For. Exp. Sta.* No. 97, 1956. pp. 2. 1 ref.

Presents data obtained over 10 years from seed traps set up in 1946 in a 35-year stand on an old-field site, in S. Carolina, comparable in density to a managed stand. Quantities varied from 56,000 to > 1 million sound seeds/acre. Viability was lowest in the poorest and highest in the best seed-year, with a mean of 66%. Seed-fall in most years started in the second week of Oct. and was practically completed in early Jan.

1496. TOMESCU, A. **Observaţii in legătură cu prevederea fructificaţiei la speciile forestiere. [Forecasting seed production in forest trees.]** *Rev. Pădurilor* 70 (7), 1955 (311–3). 6 refs. [Rum.]

Gives the results of some observations on the flowering of *Quercus cerris* and *Q. robur* (presented graphically) showing number of twigs with ♂ aments, buds with ♂ aments, number of ♂ aments, number of twigs bearing ♀ flowers, number of peduncles bearing ♀ flowers, all in relation to intensity of flowering. There was a significant difference between the two species in the distribution of ♂ and ♀ flowers.

1497. RUDOLF, P. O. **Guide for selecting superior forest trees and stands in the Lake States.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 40, 1956. pp. 32.

Discusses, with illustrative drawings, points to be considered in selecting superior and plus (defined as outstandingly superior) trees, including growth rate, crown and stem form, resistance to climatic extremes, disease, insect pests and animal damage, wood quality, photoperiod, seed production, and relative tolerance to competition. More detailed information is given (with photos) for the following species: *Pinus resinosa*, *P. strobus*, *P. banksiana*, *Abies balsamea*, *Picea glauca* and *Larix laricina*.

1498. **[Papers read at a discussion on forest seed orchards, Waldsieversdorf, 24–26 October, 1955.]** *Züchter* 26 (9), 1956 (270–87). 23 refs. [G.] E.M.B.

Papers on: problems of making early tests in tree breeding (*O. Schröck*); the arrangement of trees and clones in seed orchards (*W. Langner*); tree-breeding in Hesse (*R. Schmitt*); and the development and recognition of races (*K. Stern*).

1499. OZAWA, J., and MATSUZAKI, S. **[Promotion of the fruiting of Japanese Larch: (1) The effects of manures on the formation of flower buds.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (58–71). 3 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 16 No. 2880.] Contains a comprehensive table showing the % flower, leaf, dead, and unclassified buds counted on selected branches (position and dimensions given) of trees growing in the upper, middle and lower parts of a 25° slope under conventional NPK treatment variations. Graphs show this % of flower bud production for each treatment for the upper and lower parts of the slope and for trees constricted with wire at 40 cm. above ground. On untreated plots the production of flowers was higher in the upper parts of the slope and this was true also for complete fertilizer, minus N, and K alone. The effect of minus P and minus K was to even out these differences. Constriction with wire induced increased flower production which also decreased down the slope. Unconstricted Larch produced few flowers. When only K and P were used the best seasons of application for flower production were the spring and autumn respectively. Branch elongation is negatively correlated with flower production.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 1480, 1509, 1683.

1500. NETOLICKÝ, J. K výstupu do korun stromů. **[Climbing to tree crowns.]** *Lesn. Práce* 34 (10), 1955 (447–9). [Cz.]

[Cf. *F.A.* 17 No. 1468.] Illustrated description of a method of climbing by means of a rope, attached to the safety-belt or jacket of the climber, passing over a branch and wound on a manually operated winch secured to the butt of the tree.

1501. ZOBEL, B. J., CECH, F. C., and GODDARD, R. E. **Cost of seed collection from a Pine seed production area.** *J. For.* 54 (11), 1956 (750–5). 15 refs.

In E. Texas seed was collected in Oct. 1955 from 6 acres of 44-year *P. taeda* and *P. echinata* stands that had been released in May. All trees were climbed that had > 20 cones visible from the ground through binoculars. The team consisted of 2 climbers, one experienced and one new, and a man to pick up cones. Release had not had time to stimulate growth, and the crop was a moderate one. The ratio of cones counted from the ground to cones picked from a tree was ca. 1/3. Picking the cones, whether there were few or many, took little time once the tree had been climbed. The yields of cones and seed and the cost of the seed collected (based on a wage-rate of $2/hr.) are tabulated. Cost of collecting from standing trees was 2·5 to 3 times that from felled trees. For *P. taeda* 200 cones per tree is the minimum worth collecting; for *P. echinata* where the % of sound seed is lower, the minimum is higher. As yet there is little evidence to show whether the extra expense is justified by genetic gains.

1502. DAVIS, B. **The Chipola chimney; a cone kiln for research use.** *J. For.* 54 (12), 1956 (845–6).

Describes a kiln for drying cones. A 1600-watt electric heater with fan blows warm air through a wind tunnel into an opening in the base of a number of wooden sections, each 36 × 48 in. and 8 in. deep, with 16-mesh wire screen (or ½-in. hardware cloth) covering the bottom. A hardware cloth for the opening and a cover frame are necessary where mice are a problem.

1503. LAKON, G. Beeinflussung der Keimfähigkeit der Fichtensamen durch den Entflügelungsprozess. **[The effect of de-winging processes on the viability of Spruce seed.]** *Saatgutwirtschaft, Stuttgart* 7 (6), 1955 (175–6). 2 refs. [G.] C.G.B.

Discusses potential injuries to Spruce seed by certain extraction methods, such as bruising by excessively hard brushes, and the use of water. Experiments comparing 15 samples de-winged with water and 15 without, indicated that careful wet processes did not affect immediate germinative capacity, but greatly depressed it over a period of 2 years. In one case of commercial de-winging, germinative capacity had been reduced by 52% after 3 years, and the existing mistrust of seed so extracted must be considered justified.

1504. SPÎRCHEZ, Z. I. Contribuții la stabilirea indicilor calitativi ai semințelor de dirmox (*Viburnum lantana* L.). **[Determining quality indexes for seed of *V. lantana*.]** *Rev. Pădurilor* 70 (12), 1955 (583–90). 11 refs. [Rum.]

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

1505. **Forest seed directory 1956.** FAO, Rome. 1956. pp. 178. [E.F.Span.] [Cf. *F.A.* 17 No. 325.]

232.315. Seed Storage and Treatment

See also Nos. 1391, 1533, 1563.

1506. CURTIS, J. D. **Effects of origin and storage method on the germinative capacity of Ponderosa Pine seed.** *Res. Note Intermt. For. Range Exp. Sta.* No. 26, 1955. pp. 5. 5 refs.

Seed collected from young stands and scattered old growth of *P. ponderosa* at 4000 to 5500 ft. alt. was placed in air-tight glass jars and subjected to 5 methods of storage: (*a*) at 32° F., (*b*) at 0°, (*c*) in a root cellar at 30° to 60°, (*d*) underground at 33° to 55°, and (*e*) in a loft at − 20° to 108°. After 14 years' storage, the seed was sown out of doors. The germinative capacity of (*a*) and (*b*) was significantly higher than that of (*c*) and (*d*); seed of (*e*) did not germinate at all, whatever its origin. There was little difference in the germinative capacity of (*b*), except that seed from scattered old growth at 5500 ft. germinated poorly.

1507. VARGA, D. Cercetări de laborator cu privire la scurtarea perioadei germinative la semințele de *Picea excelsa* Link., cu ajutorul acidului azotic. **[Laboratory studies on the hastening of germination of *P. abies* seed by the use of nitric acid.]** *Rev. Pădurilor* 71 (2), 1956 (97–100). 20 refs. [Rum.]

In 18-hour cold soaks, total germination was greatly reduced by the use of low concentrations of HNO_3 (*N*10 — *N*20) but progressively increased by increasingly high concentrations (80·25% for *N*20,000) compared with untreated controls (56·75%) or water-soaked seed (72·5%).

1508. JAHNEL, H. Beiträge zum Stratifizieren von Forstsaatgut. II. **[The stratification of forest seed. II.]** *Angew. Bot.* 30 (6), 1956 (185–201 + 1 tbl.). 6 refs. [G.g.] E.M.B.

Reports on experiments with *Carpinus betulus*. The embryo is fully developed in seed harvested in mid-September. Unstratified seed harvested in September and sown immediately showed a small germination %; unstratified seed harvested in October did not germinate. Even with stratified seed, the later the time of harvesting, the lower was the germination %. The best results were obtained with stratification for 24–26 weeks, keeping the temperature for the last 8 weeks as near 0° C. as possible. Experiments in stratification at various, and not entirely constant, temperatures, gave highest germination % and speediest germination for seeds stratified for the preliminary period at ca.

7° C. A similar experiment with constant temperatures gave no germination. *C. betulus* appears to require higher temperatures for germination than most other forest trees. Germination of seed stratified for the required length of time is very speedy. [Cf. *For. Abstr.* 17 (No. 3854).]

1509. THIRGOOD, J. V. **[Treatment of *Prosopis* seed.]** *Rep. For. Dep. Cyprus 1955*, 1956 (66).

It has been stated that to obtain germination of *Prosopis juliflora* and *P. tamarugo* seed it is necessary for them to be passed through the digestive tract of a goat, but seed in the pod proved unpalatable to goats. Various methods of pretreatment were tried, but none had much effect on germination. Seed extraction from the pod, however, was facilitated by the use of H_2SO_4.

232.318. Seed Testing. Germination Tests. Seed Quality

1510. TOOLE, E. H., *et al.* **Effects of light and temperature on germination of Virginia Pine seeds.** *Abstr.* in *Plant Physiol.* 31 (Suppl.), 1956 (xxxvi). O.R.E.

In preliminary studies, seeds of *Pinus virginiana* failed to germinate in the dark, but germinated well after exposure to red light. The germination % at constant temperatures was best at 25° C., and very low at 20° or at 30°. Practically complete germination was obtained by holding the imbibed [?] seeds at 5° in darkness for 24 hours, followed by exposure to red light and return to darkness at 25°. The germination of these seeds is reversed [?] by far-red radiant energy.

232.32. Plant Rearing. Nursery Practice

See also Nos. 1437, 1475, 1477, 1480.

1511. HARDEE, J. H. Procedimientos para pequeños viveros forestales en Chile. **[Procedure for small forest nurseries in Chile.]** Dirección de Bosques, Instituto de Asuntos Interamericanos. 1955. pp. 27 + 1 tbl., 10 sets of dgms. 1 ref. [Span.]

Practical recommendations, listing species suitable for large-scale afforestation, with notes on nursery practice.

1512. RUBŢOV, Ş. Contribuţii la cultura laricelui în pepiniere. **[Raising *Larix decidua* in the nursery.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 8 (1), 1956 (221–32). 4 refs. [Rum.rum.russ.f.] O.R.S.

Experiments were made at sites in the mountains (960 m.) and hills (460 m.), using seed of Alpine and Sudeten provenances (rates of germination 70·7 and 32·5% respectively). The addition of soil from a young Larch forest to the seed drills doubled or trebled seedling growth rate and increased the content of micro-organisms in the soil by 50%. Addition of farmyard manure and humus from a Beech forest gave very inferior results. Optimum depth of sowing was 0·5–1 cm. Narrow (2-cm.) drills gave better results than wide (6-cm.). Much better results were obtained at the higher than at the lower altitude.

1513. CIRIN, A., and LAZAR, G. Cultura chiparosului de baltă in pepinieră. **[Raising *Taxodium distichum* in the nursery.]** *Rev. Pădurilor* 70 (9), 1955 (427–8). [Rum.]

Methods used include stratification for 90 days in calcined sand or for 28 days in a hotbed, sowing in drills in May, and shading during the first year.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 1369, 1528–30, 1533, 1588.

1514. Die Anwendung von Düngemitteln in der Forstwirtschaft. Faustzahlen für den praktischen Forstwirt. **[The use of fertilizers in forestry. Working figures for the practical forester.]** Ruhr-Stickstoff Aktiengesellschaft, Bochum. 1956. pp. 57. [G.]

Contains information, mostly tabulated, on the nutrient status of soils; the nutrient requirements of various species at various ages, with suggested fertilizing programmes for many conditions, e.g. raw humus; the composition of German commercial fertilizers, their modes of action and when they are indicated; composting; the preparation of nutrient solutions for peat-pot plantings, etc.

1515. TSUDA, K. **[Manure examination for *Larix*. (IV). The effects of mixing sawdust in the soil on the growth of Japanese Larch seedlings.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (6–10). [Jap.jap.e.*e*.]

Treatments included (*a*) $(NH_4)_2SO_4$, (*b*) farmyard manure, (*c*) sawdust, (*d*) fallen leaves, and combinations (*a*) + (*b*) and (*a*) + (*b*) + (*c*). Tables show their effect on (1) the green weight of seedlings (leaf, stem and root), (2) height, (3) air-dry % N and (4) the absorption of N, in these parts. With (*c*) only, (1) and (2) decreased but with (*c*) + (*b*), (1) did not always decrease and (2) was unaffected. [Cf. *F.A.* 16 No. 2906.]

1516. URSIC, S. J. **Late winter prelifting fertilization of Loblolly seedbeds.** *Tree Plant. Notes* No. 26, 1956 (11–3).

Loblolly Pine seedlings [age not stated] were given applications of N and K_2O at 160 and 200 lb./acre respectively in January, were lifted a month later, and planted out with untreated controls. Measurements made in Oct. showed that treatment had a detrimental effect on survival (69% for treated against 81% for untreated plants) and no effect on height growth.

1517. TARABRIN, A. D. K voprosu ob usvojenii fosfora sejancami drevesnyh porod i travjanistymi rastenijami. **[Phosphorus assimilation by tree seedlings and herbaceous plants.]** *Dokl. Akad. Nauk SSSR* 108 (5), 1956 (965–7). 2 refs. [Russ.] A.P.B.

In a nursery near Moscow, in May 1955, sowings of Oak were treated at sowing time with superphosphate containing radioactive P, introduced at depths of (*a*) 6 cm. or (*b*) 16 cm. After 49 days, leaves of seedlings from (*a*) were twice as radioactive as those from (*b*). The amount of radioactive P taken up varied considerably in individual plants. Examination of root systems showed that

most of the absorbing roots were in the top 6 cm. of soil. In a second experiment, in June 1955, there were 3 treatments (*a*) and (*b*) as before, and (*c*) with the same quantity of radioactivated superphosphate per row, divided into two layers, at 6 and 16 cm. depth. Leaves from (*a*) again took up considerably more than leaves from the other two treatments. The P uptake of common nursery weeds in the same bed extended over a longer period and was sometimes 10 times that of the Oak seedlings, which emphasizes the need for timely weeding.

1518. BENZIAN, B., and WARREN, R. G. **Copper deficiency in Sitka Spruce seedlings.** *Nature, Lond.* 178 (4538), 1956 (864–5). 6 refs.

Gives experimental data for the investigation already reported [cf. *F.A.* 18 No. 357] on the curing of tip-burn of Sitka Spruce seedlings by applications of hop-waste compost. The Cu content of hop-waste is ca. 1000 p.p.m. whereas that of unextracted hops was found to be only ca. 95 p.p.m. It is presumed that a large part of the Cu content of the former is due to brewery sources, e.g. copper boilers used to boil the hops.

1519. FÖLLER, H. Kompostrezepte. **[Recipes for compost.]** *Allg. Forst- u. Jagdztg.* 126 (8/9), 1955 (191–2). [G.e.]

Gives instructions for making compost for nurseries, with stable manure, leaves, or needles as main ingredients, indicating proportions of materials, structure of heaps, treatment etc.

1520. HUTT, P. A. **The Dunemann nursery system.** *Quart. J. For.* 50 (4), 1956 (332–3 + 4 photos).

Further notes on the use of this system on a private estate in Shropshire [cf. *F.A.* 17 No. 3866], with details of costs, protection against birds, germination etc. An experiment is being made in the use of home-made compost covered by a thin layer of leafmould in place of litter, which may not always be available.

1521. **Waste utilization.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55*, 1955 (96).

Methods for accelerating decay of the non-lignin portion of finely divided wood waste were further investigated with a view to developing a soil improver. A number of wood-rotting organisms were tested, some of which brought about rapid decomposition of waste from *Pinus radiata* and *Eucalyptus regnans*. It was found that *Lenzites trabea* produced maximum decay (measured by loss in weight) when peptone equivalent to 0·32% N was added. With 0·8–1·6% N, decomposition was less than when no peptone was added.

232.323. Sowing and Covering

See also No. 1534.

1522. MONY, C. C. **Force feed seed hopper.** *Tree Plant. Notes* No. 26, 1956 (7–10).

Describes, with specifications and scale drawings, a home-made adaptation of the Planet Junior 156 Seeder used at Vallonia Nursery, Indiana. The original seed hopper with gravity feed requires the use of perfectly clean seed, but the modified feed will take ordinary roughly cleaned seed.

1523. ARNOLD, I. **Drill *vs.* broadcast sowing.** *Tree Plant. Notes* No. 26, 1956 (5–6).

A comparison was made between sowing Scots Pine, Austrian Pine, and Norway Spruce seed in the nursery (*a*) with a mechanical drill, and (*b*) broadcast with a fertilizer spreader. Seedlings were dug up and weighed (top weight, root weight, total weight and top/root weight ratio) at 2 years, and the results are tabulated. It is concluded that, though (*b*) does not produce better plants, it does produce more good plants per unit area and is cheaper; the crowns also close earlier and smother many small weeds, thus reducing weeding costs in the latter part of the second year.

1524. MIKOLA, P. Kylvötiheyden vaikutus taimien laatuun taimitarhoissa. **[The effect of sowing density on seedling quality [of Pine and Spruce] in nurseries.]** *Metsät. Aikak.* 1956 (5), (177–80). 4 refs. [Fi.e.]

Results of a study in Finnish nurseries show that sparse sowing gives better seedlings, although seed used per unit area will vary with local conditions. Adequate results are obtained with 1·2–1·8 kg./are, and careful sowing might further reduce these amounts. *From author's summary.*

1525. LIMSTROM, G. A., and FINN, R. F. **Seed source and nursery effects on Yellow-Poplar [*Liriodendron tulipifera*] plantations.** *J. For.* 54 (12), 1956 (828–31). 3 refs.

[Cf. *F.A.* 16 No. 2959.] An attempt was made to analyse factors causing differences in height and diameter of seedlings growing under identical nursery conditions. Stem diam. was significantly correlated with seedbed density in seedlings grown from the seed of one tree, and varied from 0·065 in. to 0·175 in. as density decreased from 80 to 10 seedlings per sq. ft. Observations from two nurseries showed that the height of seedlings varied according to the seed source, and within the seed-source according to the seed-tree. A study of germination dates showed that, whereas the majority of large seedlings had germinated by 26 May, < 50% of the small seedlings had done so. An analysis of data from a 5-year-old plantation showed that the development of each tree was correlated with its size at planting; after 5 years the height of seedlings of 0·3 in. diam. was 3 times that of seedlings of 0·15 in. diam. at planting.

1526. RUBŢOV, Ş., *et al.* Epoca de semănare a seminţelor forestiere în pepiniere şi modul de acoperire a semănăturilor. **[Sowing season and method of covering sowings in forest nurseries.]** *Rev. Pădurilor* 71 (2), 1956 (92–6). [Rum.]

Tabulates data on optimum season for sowing, requirements in covering and watering, and average date of germination, (*a*) in forest-steppe, (*b*) in the mountains, for 36 forest species commonly grown in Rumania.

1527. RUBŢOV, Ş., *et al.* Epoca optimă de semănare a seminţelor forestiere în pepiniere şi modul de acoperire a semănăturilor. **[Sowing**

season and method of covering forest seed in nurseries.] *Rev. Pădurilor* 71 (3), 1956 (149–52). 1 ref. [Rum.]

Gives data, for Rumanian conditions, for the following species: *Quercus robur*, *Q. sessiliflora*, *Q. pedunculiflora*, *Q. borealis*, *Fraxinus excelsior*, *Acer platanoides*, *A. campestre*, *A. tataricum*, *Tilia platyphyllos*, *Robinia pseudoacacia*, *Gleditsia triacanthos*, *Sophora japonica*, *Cornus sanguinea*, *Ligustrum vulgare*, *Euonymus europaeus*, *Crataegus monogyna*, *Rhamnus frangula*, *Sorbus torminalis*, *Acer pseudoplatanus*, *Abies alba*, and *Pinus sylvestris*.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 1517, 1763–4.

1528. FOSTER, A. A. **Fumigation of forest nurseries in the southeast [U.S.A.] for control of weeds and root rot.** *Tree Plant. Notes* No. 26, 1956 (1–2).

Soil fumigation with MeBr is commonly practised in nurseries to control root rot (cause unknown) and weeds (especially nut grass). It is, however, expensive (total cost $400/acre), and search for a cheaper substitute has been made. The most promising material so far tried is Vapam [see next abstract]; used at a rate of 60 gal./acre it completely controls nut grass and gives reasonably good control of root rot, at a cost of $180/acre. Vapam has the great advantage of ease of application; it can be pumped into the irrigation system slowly at a rate of 60 gal./acre, so that it takes 20–30 min. to apply. This must be followed immediately by at least ½-inch of water to seal it. Vapam decomposes rapidly and evaporates as soon as it is diluted, but if properly sealed it will remain in the soil for several days. Disking and planting should be delayed for 2 weeks after treatment.

1529. BRISCOE, C. B., and STRICKLAND, F. R **Vapam shows promise as a forest nursery herbicide.** *Tree Plant. Notes* No. 26, 1956 (3–4).

Tests were made in the LSU School of Forestry nursery of Vapam (Na N-methyl dithiocarbamate dihydrate) as a pre-emergence drench [see preceding abstract]. The heaviest treatment tested (4 quarts Vapam/100 sq. ft. of bed area) gave the best results—complete weed control for 35 days and 91% control for 60 days. Germination, survival, and growth of *Pinus glabra*, *P. taeda*, *P. elliottii* and *P. palustris* were apparently unaffected when seed was sown 12 days after bed treatment, and for *P. palustris* sowing 3 days after treatment gave no significant decline in germination or survival. Of hardwoods sown 12 days after treatment, only *Liquidambar styraciflua* showed some chlorosis and reduction in height growth immediately after germination, but by 90 days after sowing colour was normal and cumulative height growth equalled that of the controls.

1530. MOLIN, N., and TEÄR, J. Ogräsrensning i plantskolor med kemiska preparat. **[Chemical weed control in nurseries.]** *Medd. SkogsforsknInst., Stockh.* 46 (6), 1956. pp. 16. 13 refs. [Sw.sw.e.*e.*] Price *Kr.*1.

A preliminary report, after one year's trials in two Swedish nurseries, using 8 different chemicals or dosages before, or 11 chemicals or dosages one week after sowing Alder, Norway Spruce, and Scots Pine. In the soil-sterilization experiments MeBr + chloropicrin (1) applied as Dowfume MC-2 in gas form 48 hours before sowing had the best long-term effect, reducing weeds to 8% of those on the control plots, with no weeds emerging during the first month. Formalin (2) and allyl alcohol (3) applied, like the remaining herbicides, as a liquid 2 weeks before sowing, also gave good results. (1) and (2) were particularly effective against *Poa annua*, and (1) also against *Agropyron repens*. (1) and (2) stimulated growth of Pine and Spruce. In the pre-emergence tests, allyl alcohol and Premin (a salt of dinitrobutylphenylalkanolamine) gave good results without any decrease in the number of plants. Laboratory tests on the decomposition of substances in the soil showed that germination of Pine and Spruce seeds was adversely affected by dosages of mineral oil equivalent to 3 years' spraying in the nursery.

1531. VIDME, T., and BYLTERUD, A. Ugrassprøyting med white spirit og white spirit + terpentin i skogplanteskoler. **[Weed control by white spirit and white spirit plus turpentine in forest nurseries.]** *Årsskr. norske Skogplantesk. 1955*, 1956 (97–129). 31 refs. [Nor.nor.e.]

Summarizes results for 1950–53, some of which have already been published [see *F.A.* 14 No. 3313]. Both white spirit and white spirit + 10% of turpentine caused serious damage to first-year seedlings of Norway Spruce, but only slight (often temporary) damage to 2- to 4-year plants. Two-year Scots Pine suffered slight injury from white spirit alone and rather heavy damage to needles from fortified white spirit but, in spite of repeated applications through the summer, there was no loss of plants. Common weeds are classified by their resistance to white spirit at the rate of 1000 litres/ha. *Veronica officinalis*, *Erysimum cheiranthoides*, *Stachys palustris*, *Matricaria matricarioides* and *Senecio vulgaris* are all resistant, i.e. show 51–100% survival. Addition of turpentine increased the effectiveness of control especially of the resistant species, the increase in kill being significant for *M. matricarioides* and *E. cheiranthoides*. Differences in results of spraying at different times of day were slight and insignificant. There was no significant correlation between weather and effect on different weed species, though for *Poa annua* there was a strong tendency to poorer results from spraying during rain than from spraying in dry weather. Time needed for hand weeding after spraying during (1) bright and warm, (2) cloudy but dry, (3) wet weather, was studied. In group (1) spraying at midday gave significantly poorer results than spraying in the morning or evening, but there were no significant differences in groups (2) or (3). Mean results of all 34 trials in 1952–53 showed that the addition of turpentine significantly reduced hand-weeding time and the same is true in groups (1) and (2) but not in (3). On plots treated with white spirit at the rate of 1000 litres/ha., hand-weeding time was reduced by 111·9 man-hr./ha. and on those treated with 900

litres of white spirit plus 100 litres of turpentine there was an additional reduction of ca. 100 man-hr./ha. Considerably less time was needed for hand weeding when weeds were sprayed at the stage from cotyledon to 4 true leaves, than at the stage from 6 true leaves to flowering.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

See also No. 1734.

1532. THIRGOOD, J. V. **[Stumping and root-pruning of nursery stock.]** *Rep. For. Dep. Cyprus 1955*, 1956 (64–5).

An experiment is in progress to determine the effect of stumping and root-pruning on *Acacia cyanophylla*, *Eucalyptus rostrata* and *Pinus brutia*. This has had the important result of showing that Eucalypts can be held over for a second season by cutting back the main stem, and that they remain in plantable condition. Both *E. rostrata* and *P. brutia* can clearly withstand much harder nursery treatment during winter than is current practice. Root-pruning did not significantly influence height growth of any species. Stumping significantly reduced height growth of *E. rostrata* but not that of *A. cyanophylla*, which was, however, controlled by combined stumping and root-pruning. Stumping of *E. rostrata* and *A. cyanophylla* had no influence on mortality. Root-pruning of *A. cyanophylla*, if left until a large taproot has developed, as is standard practice, increased mortality. Root-pruning did not affect mortality of *E. rostrata* or *P. brutia*.

232.327. Protection Measures in Nurseries

See also Nos. 1528, 1787–90, 1811, 1813–4, 1915.

1533. MOLIN, N. Fallsjuka på groddplantor av barrträd. **[Damping-off of coniferous seedlings.]** *Medd. SkogsforsknInst., Stockh.* 45 (7), 1955. pp. 12. 12 refs. [Sw.sw.e.e.] Price *Kr.*1.

A preliminary report dealing chiefly with the effect of coating Pine seed with various organic fungicides (chiefly metal salts) on germination, on pure cultures of *Fusarium*, *Pythium*, *Phytophthora* and *Rhizoctonia* spp. brought into contact with them, and on seedling survival in greenhouse tests with artificially infected soil and in the nursery. Cu 8-quinolinate, tetramethyl thiuramdisulphide and tetra-chlor-*p*-benzoquinone were promising.

The use of formalin for partial soil sterilization gave satisfactory results with Pine and Spruce (sown 1 or 2 weeks after treatment) including good weed control and some growth stimulation.

1534. CAFLEY, J. **Damping-off in fall- and spring-sown seed beds in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (2–3).

Spring-sown *Pinus resinosa* lost 80% of seedlings through damping off, compared with ca. 30% for autumn-sown. Study of temperatures at the relevant times indicates that the spring-sown seed germinates a fortnight later and that the seedlings reach the critical stage at a time when temperatures are higher and more favourable to damping-off fungi than at the similar stages of autumn-sown seedlings.

1535. RUMMUKAINEN, U. Männyn sienitautien torjunta taimitarhoissa. **[Prevention of fungus diseases on Pine in nurseries.]** *Metsät. Aikak.* 1956 (6/7), (211–4). 17 refs. [Fi.e.]

Briefly describes the fungi concerned, and recommends that (1) nursery soils should be kept rich in humus; (2) seed should be disinfected; (3) the sown area should be covered with crushed peat; (4) plants should be sprayed twice with Cu sprays at the end of July or when damage is observed; (5) seedbeds should be sprayed with special preparations just before the first autumn snowfall; and (6) snow melt in spring should be hastened by spreading ashes of the like on the surface. *From author's summary.*

1536. JAMALAINEN, E. A. Männyn karisteen torjunta kemiallisilla aineilla Leksvallin taimitarhassa. **[Control of the needle-cast of Pine with chemicals at the Leksvall nursery.]** *Silva Fenn.* 88 (2), 1956. pp. 10. 4 refs. [Fi.e.e.]

Needle-cast of Scots Pine nursery stock caused by *Lophodermium pinastri* was completely controlled by fortnightly spraying throughout the growing season (20 May–27 Sept.) with 2% Bordeaux mixture or Dithane 2–78 (zineb); Dithane D-14 (nabam) was rather less effective. Lime-sulphur, Burgundy mixture, thiram, captan and PCNB were comparatively, and phenyl mercury preparations entirely ineffective.

1537. SALISBURY, P. J., and LONG, J. R. **A new needle blight of Douglas Fir seedlings caused by *Rosellinia herpotrichoides* Hepting and Davidson.** *Abstr.* in *Proceedings, 22nd Session Canadian Phytopathological Society, Edmonton 1955* No. 23, 1956 (19). I.M.I.

The first report of this fungus on nursery stock of Douglas Fir comes from British Columbia. In autumn and winter 1954–55 it killed all needles on 2 + 0 plants within a zone of continuing high humidity. Beds with high water-tables, having denser and taller seedlings, suffered most. Incidence varied from 30% to sporadic, and averaged 3% for the nursery. *In vitro*, optimum temperatures for radial growth of the fungus were 20–25° C.; at 3–4° growth was slight, at 0° nil.

1538. GENTILE, A. C., and JOHANSEN, R. W. **Heat tolerance of Slash and Sand Pine seedlings.** *Res. Note Stheast. For. Exp. Sta.* No. 95, 1956. pp. 1.

To study the applicability of hot-water treatment for nematode control, the roots of one-year-old seedlings were immersed for 17 or 25 minutes in water of constant temperatures between 112° and 130° F. before planting out. Survival %s after 4 months were not affected by water at 116°, but those treated at 120°, especially Sand Pine, had much greater mortality, and higher temperatures resulted in the death of nearly all plants.

232.328. Vegetative Propagation

See also Nos. 1292, 1314, 1787, 2321.

1539. O'ROURKE, F. L. S. **The Bolivar pit method of rooting softwood cuttings.** *Amer. Nurserym.* 104 (10), 1956 (9–10). [Cf. *F.A.* 17 No. 2737.]

1540. WIDMOYER, F. B., and WATSON, D. P. **Use of polyethylene greenhouse for rooting softwood cuttings.** *Quart. Bull. Mich. agric. Exp. Sta.* 38 (3), 1956 (350–2). O.R.E.

Describes an aluminium-frame portable unheated greenhouse covered with 0·006-gauge polyethylene which was used in the spring of 1955 for rooting cuttings, which calloused and rooted normally, in vermiculite. Temperature fluctuated widely, and was considerably higher inside than outside during daylight. Relative humidity was much lower inside, and it was necessary to operate a constant mist during daylight hours to reduce humidity and temperature fluctuations.

1541. DORSMAN, C., and RAVENSBERG, K. Stekken onder waternevel. [**Propagating cuttings under mist spray.**] *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (27–42). [Du.]

The apparatus and methods used are described and the results discussed and tabulated. Six conifer species gave good results by this method, rooting % being considerably higher than for cuttings under double glass. Summary tables show the best treatment (rooting medium, use of growth regulators etc.) for the different species tested.

1542. BOER, S. DE. Stekproeven. [**Propagation by cuttings.**] *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (20–3). [Du.]

Brief notes for a number of species, including *Cryptomeria japonica*, *Metasequoia glyptostroboides*, *Sequoia gigantea* and *Taxus* spp., indicating degree of success, medium used, treatment with growth regulators etc.

1543. WELLS, J. S. **Problems in the rooting of *Taxus*.** *Amer. Nurserym.* 104 (7), 1956 (15–6, 83–6).

Cuttings taken from *Taxus* spp. in April 1954 were treated with 4 mg./g., 8 mg./g. or 10 mg./c.c. concentrated dip of indolebutyric acid and left in a greenhouse till September, being watered daily. Of 2- and 3-year-old cuttings of *T. hicksi* and *T. cuspidata* (spreading var.) 90% rooted when treated with 10 mg./c.c., compared with 0–5% rooting for controls. Younger wood responded less well to treatment. *T. cuspidata* var. *nigra* requires much stronger treatment to induce any rooting. Cuttings rooted better in flats in a hotbed than in a greenhouse.

1544. Stiklingsformering av gran. [**Propagating Spruce by cuttings.**] *Beretn. Regnskap Skogbr. Skogind. ForsknForen. SkogforsknGruppe 1955*, 1956 (11–4). [Nor.]

In greenhouse experiments in 1954–55, 70–90% of the cuttings rooted. Rooting was best in a medium consisting of 50% by volume of coarse sand and 50% fresh sphagnum moss. Mother trees < 20 years old gave the best results. In another experiment using Spruce from the forest limit, 11 Spruce showing natural layering gave more rooted cuttings (64%) than those without layering.

1545. SINGH, P. **Vegetative propagation in some Bignoniaceae.** *Sci. & Cult.* 21 (12), 1956 (737–8). E.M.B.

Hard- and softwood cuttings of (*a*) *Kigelia pinnata*, (*b*) *Jacaranda mimosaefolia* and (*c*) *Stereospermum chelonoides* were treated with 10, 20 and 40 p.p.m. of aqueous β-indolyl acetic acid for 6, 12, and 24 hours in separate lots of 12 each, with plain water for the controls. Cuttings were then potted separately in coarse sand; all callused after 6 weeks. All softwood cuttings died after 4 months, and hardwood cuttings of (*b*) and (*c*) by 6 months. In the best results, 4 survivors of (*a*) treated with 20 p.p.m. for 12 hours, had produced shoots and after 8 months were producing fast-growing roots.

1546. RUBŢOV, Ş., and BÎNDIU, C. Noi perspective în înmulţirea vegetativă a plopilor negri hibrizi în pepinieră. [**A new method for vegetative propagation of hybrid Black Poplars in the nursery.**] *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 8 (2), 1956 (381–405). 5 refs. [Rum.rum.russ.f.*f.*] O.R.S.

The use of very short (6- to 8-cm.) cuttings, planted horizontally, gave very good results. The processes of callus- and root-formation are described in detail with numerous drawings. Treatment of cuttings with an emulsion of honey increased the take from 25 to 72·5%; treatment with a heteroauxin was less successful. Plants obtained in this way from short cuttings closely resembled seedlings.

1547. ZAK, B. **Experimental air-layering of Shortleaf and Loblolly Pine.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 69, 1956. pp. 12. 6 refs.

Several modifications of the air-layering technique [cf. *F.A.* 16 No. 4026] as applied to the stems of 2½-year-old Shortleaf and Loblolly Pine seedlings and to branches of grafted Shortleaf are described and discussed. The use of air-layering as a tool for studying factors involved in the rooting of cuttings is considered. A method of air-layering potted seedlings horizontally in a wooden trough filled with sphagnum moss is described. Blocks of Du-Pont synthetic sponge were tried successfully as a substitute for sphagnum moss. A less dense material moulded into fusiform halves is suggested. Comparable 2½-year-old potted Shortleaf and Loblolly seedlings were air-layered to test species differences: Shortleaf exhibited much the greater root-forming ability. Hormodin No. 3 (0·8% indolebutyric acid) greatly aided root formation in air-layering 2½-year-old Shortleaf seedlings.

Two Shortleaf grafted trees, with grafts made 8 and 9 years before from scion material of adult trees, were air-layered with poor results. The almost complete lack of success is attributed to the physiological age of the tissue. A method of air-layering Pine needle-fascicles is described and the results for 2½-year old Shortleaf seedlings are presented. In one trial, 55% of tissue slabs bearing needle-bundles produced roots. Three such 'rooted' fascicles, or dwarf shoots, broke dormancy and began shoot growth to become complete, fully established little trees. *From author's summary.*

1548. VOGEL, P. DE. Het enten van blauwe sparren onder glas. [**Grafting *Picea pungens* var. *glauca* under glass.**] *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (42–5). [Du.du.]

P. pungens var. *glauca* was grafted on to stocks

of 3-year-old *P. abies* in August. The following conclusions are drawn from the results: (1) mid-August is the best date; (2) there is less callus formation under single glass, but plastic used as the lower glass gives results as good as normal double glass; (3) stocks should be potted up; (4) scions from transplants and non-transplants give equally good results.

1549. VOGEL, P. DE. Het enten van beuken onder glas. **[Grafting Beech under glass.]** *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (45–6). [Du.du.]

Fagus sylvatica var. *atropurpurea* scions were grafted on to *F. sylvatica* on 1 March and 18 April. All grafts made on 18 April and 90–100% of those made on 1 March took; but callus formation and growth of the earlier grafts were less successful, and 1 March is considered too early.

1550. VOGEL, P. DE. Het enten van eiken onder glas. **[Grafting *Quercus robur* 'Concordia' under glass.]** *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (49–50). [Du.du.]

The % of successful grafts of *Q. robur* 'Concordia' on *Q. robur*, when plants were covered by double glass, ranged from 76 to 81, but when plants were left uncovered in the middle section of the frame only from 2 to 8. Date of grafting (24 Feb., 22 and 31 March) seemed to be immaterial.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 1540.

1551. KARSCHON, R. La production de plants forestiers en vases. **[The raising of forest plants in containers.]** *Schweiz. Z. Forstw.* 107 (11), 1956 (687–93). 22 refs. [F.]

A review, based on the literature and on 29 replies to a joint FAO/IUFRO questionnaire, dealing briefly with materials used—leaves, bamboo, wood and wood waste, paper and cardboard, metal, soil and peat, clay and concrete—shapes, sizes, costs, species so raised and countries of application.

1552. CLAUZURE, P. Utilisation des godets en polyéthylène pour les reboisements dans la région méditerranéenne. **[The use of polyethylene planting tubes in the Mediterranean region.]** *Rev. for franç.* 8 (11), 1956 (769–84 + 6 photos). 10 refs. [F.]

Explains the advantages of using tubed planting stock in this region, where climatic conditions are unfavourable, and the special advantages of polyethylene tubes (cheapness, ease of handling and transport, permeability etc.), with detailed drawings of root systems of tubed plants. The annexes include notes on root systems of 15 conifers commonly used for planting in the south of France, notes on different types of planting tube, and an account of the use of photosensitized paper for obtaining life-size representations of seedling root systems (five of these are reproduced).

1553. THIRGOOD, J. V. **[Raising nursery stock in beds, pots, soil-blocks etc.]** *Rep. For. Dep. Cyprus 1955*, 1956 (65–6).

Comparison of *Acacia cyanophylla* raised in pots and in a bed showed clearly the lower water requirements of the latter. Owing to lack of water, potted plants received minimal irrigation and many died. The bedded plants, which had been broadcast-sown and were much overcrowded, were left unirrigated for a period of 6 weeks at the height of summer, but survived better than those in pots which had received some water. Tap-root formation of these bedded plants was not excessive, and at 8 in. was no more than that of non-root-pruned pot plants receiving normal irrigation.

A trial was made of pressed soil blocks, using *Eucalyptus rostrata*. Various soil mixes were used, but there was no difference in results for the different mixes, and it was apparent that no advantage is to be gained from the use of complex and expensive soil mixtures for the raising of transplants. The blocks were in the form of truncated pyramids, 9 in. deep, 6 in. square at the bottom, tapering to 4 in. square at the top, with a planting-hole 5 in. deep, 1½ in. top diam. and 1 in. bottom diam. Only the upper part of the block was used by the plant, and much smaller blocks would prove quite satisfactory and be easier to handle. It was found necessary to fill the interspaces between the sloping sides of the blocks with soil, otherwise water did not penetrate, and the plants died.

Comparison was made between (*a*) pressed soil blocks; (*b*) clay pots 5 in. deep, 4½ in. top and 3½ in. bottom diam.; (*c*) cement pots 4 in. deep and 3 in. square; and (*d*) polythene bags, 5 in. deep and 3½ in. diam. All were planted with standard-sized *E. rostrata* seedlings of a common origin. In order of good growth, plants raised in (*a*) were best, followed by (*b*) and (*d*), while (*c*) gave poorest results. Comparison was also made of (*b*) and (*c*) free-standing, as is current practice, and sunk in raised beds, i.e. with pot interspaces filled with soil. Water requirements were found to be considerably reduced by the latter technique.

1554. KOPŘIVA, F. Použití vzrůstových látek v lesnictví. **[Use of growth regulators in forestry.]** *Lesn. Práce* 34 (10), 1955 (441–3). [Cz.]

An unspecified number of 1-year seedlings of *Tilia* sp. of similar height and development were divided into 7 equal groups, 6 of which had their roots immersed for 24 hours in one of the following solutions: (*a*) α-naphthaleneacetic acid 0·01%, (*b*) ditto, 0·02%, (*c*) β-indolylacetic acid 0·01%, (*d*) ditto, 0·02%, (*e*) cattle urine, undiluted, (*f*) ditto diluted 50/50 with water. Seedlings of all 7 groups were put in the same nursery bed on April 22. On 30 June, the respective mean heights in cm. were: (*a*) 24, (*b*) 33, (*c*) 40·5, (*d*) 37, (*e*) 28·5 and (*f*) 33·5 cm and controls 26·5 cm.

1555. POPOVICI, S., and TOTH, E. Acţiunea heterauxinei asupra plantulelor de pin comun şi pin negru. **[The effect of heteroauxin on seedlings of *Pinus sylvestris* and *P. nigra*.]** *Rev. Pădurilor* 71 (3), 1956 (177–9). [Rum.]

Experiments were made in treating 30 seedlings (6 days old) each of *P. sylvestris* and *P. nigra* with heteroauxin at different concentrations (0·2–0·002%). Mean shoot and mean root length were less in treated seedlings than in controls, but root systems

were more vigorous. Mean length of cotyledon showed no marked correlation with treatment.

232.33. Formation of Stands by Direct Sowing

See also Nos. 1452, 1491, 1572, 1584–6, 1736, 2020.

1556. Reboisement par semis directs. **[Afforestation by direct sowing.]** *Étude Com. consult. Rebois.* No. 9, 1955. pp. 16. [F.]

Practical directions for direct sowing in metropolitan France, with the exception of the Gascon landes, which need special methods.

1557. MARIAN, A. Cercetări asupra semănăturilor directe de molid in bazinul de interes hidroenergetic Valea Bistriţei. **[Experiments in direct sowing of Spruce in the catchment of the Bistriţa Valley hydro-electric undertaking.]** *Rev. Pădurilor* 70 (8), 1955 (320–4). 6 refs. [Rum.russ.]

It is concluded that, in this part of Moldavia, direct sowing of Spruce is possible on easy shaded slopes with a N. or N.E. aspect, seed being broadcast after scarification of the soil, and weeding carried out thrice annually for several years. On steep slopes only the lower half should be sown.

1558. THIRGOOD, J. V. **[Direct patch sowing *vs.* planting in Cyprus.]** *Rep. For. Dep. Cyprus 1955*, 1956 (60–1).

Failure of patch sowings in afforestation of the Northern Range has become increasingly common, and this has been variously ascribed to aspect, root competition from marginal vegetation, and air stagnation caused by high marginal vegetation. A series of experiments in trenching, cutting back surrounding vegetation etc. showed that marginal vegetation, whether acting through root competition or air stagnation, was not a factor influencing germination, seedling development, or survival. Observations suggest that failure may often be due to lack of care in raking after sowing, and consequent too deep covering of seed. Experiments are being made to compare planting, as practised in some other Mediterranean countries, with the standard patch sowings that are current practice in Cyprus. Preliminary results indicate that both Troodos and Corsican Pine [*Pinus nigra* vars. *caramanica* and *calabrica*] can be successfully established by planting, whereas sowing is unsatisfactory. Preliminary results of sowing and planting *P. brutia* and *Cupressus sempervirens* on difficult sites (slopes with dense *maquis* vegetation; south-facing, bare, severely eroded rocky slopes; and burnt areas on mountain slopes) showed striking differences in relative costs between cultivated and sown patches (10 × 10 ft. with 5 ft. between patches) and planting at 5-ft. spacing. Sowings cost 2–3 times as much as plantings, and the difference would be greater for large-scale operations. The cost of two summer cultivations has still to be added to the cost of planting, but the total expenditure should still be considerably less than for the current sowing technique.

1559. THIRGOOD, J. V. **[Establishment of *Acacia cyanophylla* fuel plantations on lowland sites in Cyprus.]** *Rep. For. Dep. Cyprus 1955*, 1956 (62–3).

Comparison of planting and direct sowing showed that planting was more successful, cheaper, and led to earlier production than sowing. Experiments in the use of fertilizers at the time of planting or sowing indicated that applications of $(NH_4)_2SO_4$ and superphosphate, alone or in combination, had no influence on subsequent survival and growth.

1560. MATSUI, Z., MORI, K., and SASAKI, M. **[The seed planting on overgrazed Sasa-range.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (217–22). [Jap.jap.e.*e.*]

To turn ill-used *Sasa* pasture to greater multiple use, an area was overgrazed (spring and autumn) for 3 years to reduce weeds, and then sown with Birches (*B. ermani* and *B. japonica*] and Alder [*Alnus japonica?*] in patches of 1 m. diam., spaced 4 × 3·5 m. (750/ha.). The successful results of 10 years' growth are shown in 6 tables. Local yield tables for 30 years' growth of the Birches and the Alder are included.

1561. VADJUNINA, A. F. Vshožestj želudeĭ v zavisimosti ot počvennyh usloviĭ. **[Oak germination in relation to soil factors.]** *Soobšč. Inst. Les.* No. 1, 1953 (59–72). 10 refs. [Russ.russ.]

Experiments were made in 1950 and 1952 in Stalingrad province on the influence of soil types (light chestnut and associated soils), cover crops and depth of sowing, on the field germination of Oak. Adverse factors were the poor soil structure, severe crusting, and the dry climate. Of the 4 soils studied, only two—light-chestnut sandy or clayey loams—are suitable for such sowings without radical measures for improvement. Sowing in small artificial hollows to trap surface run-off, and/or mulching with sawdust, gave improved germination and seedling development. Germination was best on clean-fallowed land or on clean 2-m. strips between strips of wheat, a continuous cover of agricultural crops proving unfavourable. Observations on the effect of sowing depth suggest that the optimum is 10–12 cm. for light-chestnut heavy clay-loam and 8 cm. for sandy loams; deeper sowing delays emergence, which may then coincide with drought.

1562. Protection des reboisements contre les prédateurs. **[The protection of direct sowings against predators.]** *Étude Com. consult. Rebois.* No. 10, 1956. pp. 13. [F.]

Practical guidance on physical protection, and the use of repellents and poison baits, against birds and rodents.

1563. MANN, W. F., JR., DERR, H. J., and MEANLEY, B. **Bird repellents for direct seeding Longleaf Pine.** *Forests and People, Alexandria, La.* 6 (3), 1956 (16–7, 48).

The bird-repellent Morkit, which had proved very useful in protecting direct-sown *Pinus palustris* seed [cf. *F.A.* 17 No. 3898] is now unobtainable in the U.S.A. Information is given on some possible substitutes—sublimed synthetic anthraquinone, crude anthraquinone, Winthrop Bird Repellent (containing 25% crude anthraquinone), and Arasan.

232.4. Formation of Stands by Planting

See also Nos. 1452, 1475–6, 1558–9.

232.41. Planting Stock (Type, Handling and Treatment)

See also No. 1437.

1564. KAUL, O. N. **Propagating Mesquite [*Prosopis juliflora*] by root and shoot cuttings.** *Indian For.* 82 (11), 1956 (569–72).

Stumped plants have been found the most successful planting stock for afforesting arid areas in Rajasthan, survival being 70–90%, and height at end of first growing season 8–10 ft. They are not watered and, if eaten off by cattle, shoot again.

1565. THIRGOOD, J. V. **[Planting stock stored in polythene bags.]** *Rep. For. Dep. Cyprus 1955*, 1956 (67).

Two-year plants of *Cedrus brevifolia* were individually packed for transit abroad in polythene bags. Soil was shaken from the roots, which were then wrapped in moist balls of lichen and enclosed in a polythene wrapping. The whole plant was then placed in a polythene bag; the neck of the bag was not hermetically sealed, and it was possible for air to enter. Specimens were retained for observation, and after 3 months these plants were still alive and new needles beginning to burst. Mould had developed on the lichen.

1566. URSIC, S. J. **Bale storage effective for Loblolly Pine seedlings.** *J. For.* 54 (12), 1956 (815–6).

In experiments in N. Mississippi to determine the best method of storing Loblolly seedlings, 6 bales were placed in cold storage, 6 in an unheated warehouse, and 6 planted in sand beds, with half of the bundles unbroken, and half broken and spread; periods of storage were 2, 9, 16, 23, 32 or 37 days. After one year, survival was high in all cases. Seedlings kept in cold storage showed the highest average survival (95%) and those planted in unbroken bundles the lowest (90%). Duration of storage had no apparent effect on survival and growth. During the 1955 planting season ca. 15,000,000 seedlings were stored in bales on warehouse racks at the Tallahatchie research centre and had an average first-year survival of > 80%. Where practicable, cold storage in bales is preferable.

1567. EGBERTS, H. Ontbladering van boomkwekerijgewassen met chemische middelen. **[Defoliation of nursery plants by chemicals.]** *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (122–4). [Du.]

Results of spraying a number of roadside species (including ornamentals) were not encouraging. Buds of a number of species including *Platanus acerifolia*, *Populus* spp. and *Quercus robur* were damaged, and leaf-fall was slow except for a few species including *Alnus cordata* and *Ginkgo biloba*. The chemicals tested were DF liquid, Niagarathal Chemical Industries and TA 72 and EO 12, Agrunol, Groningen.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 1588, 1650–2, 1915.

1568. IVAN, G. Organizarea raţională a procesului tehnologic in lucrările de plantaţii in regiunea de munte. **[The rationalization of planting technique in mountain country.]** *Rev. Pădurilor* 70 (8), 1955 (341–5). [Rum.]

Gives the results of work studies on organization of teams and lay-out of work; effects of working uphill, downhill, or along the contour; and relative merits of hoe and pick for making planting holes and furrows

1569. BLOKHUIS, J. L. W. Gebruik van kunstmest in de bossen. **[Use of artificial fertilizers in forestry.]** *Ned. Boschb.-Tijdschr.* 27 (7), 1955 (178–81). [Du.]

A further progress report on plots established in 1933–36 [cf. *F.A.* 12 No. 2629; 14 No. 3351]. Early differences in height and diameter growth of plots of Japanese Larch and Oak as a result of treatment with P fertilizer continued to decrease. The favourable effect of Ca treatment on Oak, Norway and Sitka Spruce and Douglas Fir, and its bad effect on Japanese Larch were still visible. Young Japanese Larch planted on land treated in 1948 with compost and artificial fertilizers are slender and crooked with heavy side branches.

1570. GIACOMELLI, C. Un attrezzo per il rapido piantamento delle pioppelle e delle talee di pioppo. **[An implement for the rapid planting of Poplar cuttings and young trees.]** *Agricoltura delle Venezie, Venezia* 10 (1), 1956 (31–7). [It.] C.G.B.

Describes a simple planting device designed by the author and made from 3 sheets of 3-mm. steel bent and soldered together. It is attached between the handles of an ordinary single-share plough from which the mouldboard has been removed, and drawn by a tractor. Workers follow the plough and feed the plants or cuttings into the planting attachment whence they fall into the slit cut by the plough, which closes up automatically behind the latter.

1571. CHIRU, V. Despre unele rezultate ale lucrărilor de plantaţii mecanizate din Dobrogea. **[Some results obtained by mechanical planting in the Dobrudja.]** *Rev. Pădurilor* 70 (12), 1955 (613–7). [Rum.]

Tabulates and discusses comparative data on survival and growth of hand- and machine-planted shelterbelts of *Robinia pseudoacacia*, *Prunus mahaleb*, *Ulmus pumila* var. *arborea*, *Prunus armeniaca* and *Salix* spp. Machine-planted trees showed good survival and in all cases superior height and diameter growth.

232.43. Spacing and Arrangement in Plantations

1572. EKLUND, B. Ett förbandsförsök i tallskog. **[An experiment in sowing and planting Pine at different spacings.]** *Medd. SkogsforsknInst., Stockh.* 46 (10), 1956. pp. 98. 27 refs. [Sw.sw.e.e.] Price *Kr.*5.

Of the trial plots established in the Crown park of Granvik (Skaraborg County) in 1906, six, of which four were planted in square spacings of 0·75, 1·25, 1·5 and 3 m. respectively, and two patch-sown in square spacings of 1 and 1·5 m., remained for

investigation. Mean diameter and mean height increased with wider spacing; b.a. and volume yield markedly decreased but, if self-thinned dead wood was excluded, optimum yield (both volume and value) at 50 years was obtained from the 1·5-m. spacing. Thinning treatments and early tending somewhat modified results, and presumably favoured the planted plots.

1573. FRANZINI, F. Note sur la densité des plantations artificielles d'Okoumé. **[A note on the density of artificial *Aucoumea klaineana* stands.]** *Bois For. Trop.* No. 50, 1956 (3–7). [F.e.span.]

Advances the theory that in dense stands of Okoumé, where the crowns of dominants combine with climbers to form a thick horizontal canopy, the trees beneath tend to grow away from the shade to reach the light and their boles become crooked. To obtain the best bole-form, trees should be widely spaced or repeatedly thinned.

233. Afforestation

See also Nos. 1253–4, 1259, 1379, 1478, 1511, 1556–61, 1564, 1650–1, 2321, 2346–7.

1574. BÁRTA, Č., and CHRZ, G. Úspěšné zalesňování kalamitních holin. **[Successful afforestation of areas denuded by natural causes.]** *Lesn. Práce* 35 (1), 1956 (14–21). [Cz.]

Describes methods used for the afforestation of areas near Pisek, in Czechoslovakia, deforested by snow breakage (1939) followed by windthrow (1941), and later overgrown with high *Calamagrostis epigeios*. The soil, generally rich in minerals and humus, lies above mainly granite of high mica content, at 420–624 m. alt., precipitation ca. 600 mm., mean annual temperature 7·71° C. The species used were: *Picea abies*, *Pinus sylvestris*, *Pseudotsuga taxifolia*, *Larix decidua*, *Tilia* sp., *Fagus sylvatica*, *Acer* sp., *Ulmus* sp., *Alnus* sp., and *Populus tremula*, as 2- to 5-year-old plants, 14 ha. of nursery reforesting 1204 ha. The broadleaved plants were put out at 1 × 1 to 1·3 × 1·3-m. spacing, in holes 40 × 40 cm., conifers being added where weed competition was intense, in patches of the same dimensions. Neither soil preparation nor watering was done. For *P. sylvestris*, the surrounding reeds were cut down to ca. ⅓ their height, and the plants treated with repellents against browsing. Mortality averaged ca. 15% for all species, with *F. sylvatica* the highest. In all, ca. 10 million plants (⅛ being broadleaved) were planted between 1941 and 1953.

1575. BUCH, M. W. VON, and HAARDT, M. Untersuchung über die Aufforstungsmöglichkeiten einer Alauntonhalde. **[Afforestation possibilities on an alum-clay spoil mound.]** *Braunkohle, Wärme und Energie, Düsseldorf* 7 (5/6), 1955 (104–8). 4 refs. [G.] L.S.

In connexion with recommendations on suitable species and fertilizer treatments for afforesting a large lignite spoil mound in Central Germany, the authors report on the root penetration observed in trees on a similar, neighbouring mound which before planting had been covered with a layer of ash, mixed with loam, ca. 30 cm. deep. Robinia, the most plentiful species, had, at ca. 20 years, penetrated the clay to a depth of ca. 70 cm.; Grey Alder, though remaining with its main root system in an intermediate clay-loam layer, showed good penetration capacity with its fine roots, whereas Birch and Pine did not penetrate the clay at all. Poplars have established themselves on the bottom of the slope, where groundwater was available, and have penetrated through the clay to reach it.

1576. OHEIMB, A. VON. Zwei Versuche zur Haldenbegrünung mittels Mülldüngung. **[Two trials of spoil-mound revegetation, using refuse as fertilizer.]** *Holzzucht, Reinbek* 10 (4), 1956 (25–6). [G.]

Spoil mounds from lead mines in W. Rhineland, consisting of washed sands covered with parent materials (upper bunter sandstone), which had been unsuccessfully planted with Pine and Alder, were spread with (*a*) sieved and burned, and (*b*) untreated town refuse, and sown with *Melilotus albus*. This grew vigorously on both sites, though better on (*a*). It is intended to harvest the seed and compost the straw, working it back into the sites for 8 or 10 years so as to enrich them sufficiently for planting with woody species.

1577. BAUER, F. Heideaufforstung in Dänemark. **[Heathland afforestation in Denmark.]** *Holz-Zbl.* 32 (136), 1956 (1647–8). [G.g.]

Describes 2 trial plots near Ulvborg, Jutland, on poor, mostly shallow, sandy soils where groups of various species, now 17–23 years old, were established by hole planting under shelter of a first forest generation of *Pinus mugo* and *P. mugo* var. *rostrata*. Height growth and general appearance are discussed and partly tabulated. *Larix japonica*, *Picea abies* and *P. sitchensis* are considered most promising, and *Abies alba* is recommended on biological grounds. *Pseudotsuga taxifolia*, in spite of maximum height growth, was diseased and poor. Of broadleaved trees, *Quercus borealis*, a Swedish provenance of *Q. robur*, and *Fagus sylvatica* did best, but their use without prior soil amelioration is not recommended.

1578. MOLL, H. W. Beobachtungen über den Einfluss der Bodenbearbeitung auf die Wuchsverhältnisse älterer Heideaufforstungsflächen. **[The influence of soil cultivation on growth in older afforested heathland.]** *Forstarchiv* 26 (2), 1955 (25–30). 3 refs. [G.g.]

Strip ploughing of heathland 50–80 years earlier, significantly influenced 6- to 10-year second-growth trees of *Pinus sylvestris* near Lüneburg. Height growth of trees on ploughed strips averaged 1 m. more than that on unploughed. Examination of soil profiles showed that root penetration was better in ploughed strips where the A horizon and the illuvial horizon had been intermingled and the pan broken up. In areas where strip ploughing had been done, the remaining strips (averaging ca. ⅘ of the area) should be ploughed to ensure regular growth of future stands.

1579. LÜCKE, H. Versuch einer Heideödlandaufforstung mit Pappeln. **[Heathland afforestation trials with Poplars.]** *Holzzucht, Reinbek* 10 (2), 1956 (9–10). [G.]

A site (near Hassefeld, Hanover) characterized by a thick, heath-humus layer over bleached fine sand and a hard pan with a low water-table was burned over and deep-ploughed twice with the Moorhale plough, and then spread with 15 metric tons/ha. of granulated furnace slag (particle sizes 0–3 mm.) which was worked in to a depth of 20 cm. In 1947 two-year-old *Populus* 'Bachelieri' were planted at 12-m. spacing, followed in 1949 by 2-year Robinia and in 1950 by a sowing of Red Oak. In 1955, the Poplars on the fertilized plots had reached a mean height of 7·1 m. and a mean d.b.h. of 10 cm. and were vigorous. The soil remained loose, the hard-pan and fragmented humus had disintegrated, and water retention capacity was improved. On the control plots, which had only been burned and cultivated, the soil had once more become compacted, the heather had returned and the Poplars had died. Additional fertilizers on the treated plots stimulated the growth of the secondary species, but not of the Poplar, water being presumably the limiting factor.

1580. JIMÉNEZ-CASTELLANOS CONDE, A. Características de los trabajos de repoblación forestal en la provincia de Córdoba. [**Afforestation methods in the province of Cordoba.**] *Montes, Madrid* 12 (71), 1956 (335–6). [Span.]

Reports successful afforestation in the Sierra Morena, on steep slopes having shallow slatey soils, with temperatures reaching 43° C. in the shade in summer and falling below zero in winter and an annual precipitation of 400–500 mm., the dry season lasting from the end of May into September. The following methods were used: (1) complete clearance of scrub followed by contour ploughing, or construction of terraces 40–50 cm. wide with drainage outlets; (2) sowing in September or October; (3) when (2) was impossible, planting in groups of 3 or 4; (4) elimination of all competing vegetation in the following spring. Species used were *Pinus pinea* and *P. pinaster*, with *P. halepensis* on a few calcareous sites and *Eucalyptus rostrata* and *E. viminalis* along certain watercourses and in sheltered situations.

1581. AHMED, M. **Note on the comparative success of some common forest species in afforestation in Bihar.** *Indian For.* 82 (10), 1956 (528–30).

234. Formation of Forest by Natural Succession

See No. 1453.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 1449, 1978.

1582. KAUFMANN, L. Ertragskundliche Ermittlungen über die Umwandlung der Kiefernbestände im Forstamt Erdmannshausen. [**Increment studies in connexion with the conversion of Pine stands in the Erdmannshausen forest district.**] *Forstarchiv* 26 (2), 1955 (30–5). [G.]

A report on *Pinus sylvestris* stands now 90 to 110 years old, underplanted between 1911 and 1920 (after deaths from root-rot) with 3 types of understorey: (*a*) mainly Silver Fir with some Beech, Birch, Larch and Douglas, (*b*) mainly Beech with some Birch, Larch, Douglas and Oak, (*c*) mainly Fir/Beech with the same admixture as (*b*). Stand density of both overstorey and understorey is well below normal. Increment of the overstorey on 17 plots totalling 450 ha. averages 2·3 cu.m. for the period since the establishment of the understorey, which compares favourably with earlier yields of pure stands on similar sites.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See Nos. 1759 *et seq.*

237. Amelioration of Forest Sites

See also Nos. 1229, 1491, 1514, 1569, 1576, 1579, 1620, 1741–3, 1851, 1978.

1583. PJJAVČENKO, N. I. Zadači lesnogo bolotovedenija. [**Problems in the study of wet peatland from the point of view of forestry.**] *Trud. Inst. Les.* No. 13, 1953 (5–9). 13 refs. [Russ.]

Discusses in general terms the need for studying waterlogging and peat formation according to type and geographical distribution, the effect of these phenomena on tree growth and regeneration, and the influence of felling and forest fires.

1584. PJJAVČENKO, N. I. Zabolačivanie lesov v basseĭne Šeksny. [**Waterlogging of forest soils in the Sheksna basin.**] *Trud. Inst. Les.* No. 13, 1953 (51–76). 12 refs. [Russ.]

A local study of the causes and effects of waterlogging with special reference to the regeneration of Pine and Spruce, which is satisfactory and will gradually relieve the waterlogged condition except in depressions, where drainage and direct sowing are necessary.

1585. KOŠČEEV, A. L. Zabolačivanie splošnyh lesosek na pesčanyh počvah i mery borjby s nim. [**The waterlogging of clear-felled areas on sandy soils and measures of control.**] *Trud. Inst. Les.* No. 13, 1953 (10–50). 9 refs. [Russ.russ.]

Studies were made on sandy soils under Pine stands and in clear-felled areas south of Leningrad. Species lists are given for the ground vegetation. Soil analyses are tabulated according to horizons to show loss on ignition, pH, oxygen content of soil water and mechanical composition of the soil. Drainage, soil cultivation and direct sowing of Pine are recommended as measures against waterlogging.

1586. KOŠČEEV, A. L. Nekotorye rezultaty issledovaniĭ zabolačivanija koncentrirovannoĭ lesoseki. [**Some results of investigations of waterlogging on the sites of 'concentrated' fellings.**] *Trud. Inst. Les.* No. 13, 1953 (77–95). 12 refs. [Russ.]

Gives the results of studies carried out from 1929 to 1936 in Leningrad province, making recommendations for drainage and measures for natural regeneration, supplemented where necessary by direct sowing.

1587. BROEKHUIZEN, J. S. VAN. Het gebruik van de kunstmestverstuiver in de bosbouw. Kunstmestverstuiving in de bosbouw. **[Spreading fertilizer in forests by dust-blower. I, II.]** *Ned. Boschb.-Tijdschr.* 28 (2; 10), 1956 (32–6; 225–34). 10 refs. [Du.du.g.]

(I) Describes with illustrations the trailer-mounted 'Silvanus' spreader supplied by the Platz engineering works, Ludwigshafen-am-Rhein. Fertilizer is fed through a hopper, carried by a belt to a wind tunnel, and expelled through it by a fan. The amount expelled can be controlled and the wind tunnel can be turned in different directions. Tests on an estate in the Netherlands, using 3 kinds of fertilizer, showed that the fertilizer could be distributed over a strip 40 m. wide in 25- to 35-year stands by blowing it to each side, roads being constructed at 40-m. spacing. Twelve tons of fertilizer could be applied per working day with a crew of three. Operating costs (depreciation, fuel, maintenance of spreader and tractor, and labour) are estimated at Fl.10/ton of fertilizer distributed. (II) In the Assen-Oost district (former heathland), soils were analysed and the amounts of additional CaO and P_2O_5 needed to give optimum conditions for different species were determined. Fertilizers were applied by the spreader at the following rates: Oak—4000 kg. dolomite marl or 3000 kg. Dolokal (each sufficient to raise the pH value by 0·3) and 1500 kg. basic slag (300 kg. P_2O_5) per ha., cost (fertilizer, labour and amortization) Fl.325/ha.; *Abies* sp., Douglas Fir, Norway and Sitka Spruce—1500 kg. basic slag/ha., cost Fl.150/ha.; Japanese Larch—1500 kg. Algiers phosphate (420 kg. P_2O_5)/ha., cost Fl.175/ha. With current prices, the improved final value of the stands as a result of fertilizing would make treatment of the conifers economic. Optimum conditions for the Oak, however, would not be obtained by this treatment and it would not be economic.

1588. MAYER-KRAPOLL, H. Die Anwendung von Handelsdüngemitteln insbesondere von Stickstoff in der Forstwirtschaft. **[The use of commercial fertilizers, particularly nitrogen, in forestry.]** Ruhr-Stickstoff Aktiengesellschaft, Bochum. 1956. pp. 126. 112 refs. [G.] Also an English version, translated and published by the Nitrogen Division, Allied Chemical & Dye Corp., 40 Rector Street, New York 6. pp. 111.

The author makes a wide survey of practical and research experience, including some data not previously published, under the following heads: (1) nurseries; (2) plantations; (3) pole stands; (4) mature stands; (5) forests damaged by litter removal; and (6) forests damaged by grazing; (7) Poplars; (8) agricultural intercropping; (9) afforestation of heath and dunes; and (10) forage for game. He discusses dosages, composition, times of first applications and repeats (if any), for a number of species, age groups and site conditions. In dealing with the improvement of raw-humus sites and sites from which litter has been removed, he describes an appliance for the application of NH_3 gas to forest soils, the Ruhr-Stickstoff Forest Roller. This has a roller of 1 m. working width, which carries a number of blades, each of which incorporates a valve that opens when the blade penetrates the ground surface; this admits the gas, which is carried in two large cylinders, at a rate of 22 injections/sq.m. About 3–4 ha./day can be treated, using a 2-wheeled tractor. In addition to transforming raw humus, the treatment helps to scarify the soil, to mix organic and mineral layers, and to improve the water-retaining capacity of both, and appears to destroy *Vaccinium*-type ground vegetation. Under (7), the author describes fertilizer trials started in 1949 on nutrient-deficient spoilmounds to test the effect on 8 Poplar varieties of various commercial fertilizers applied once at planting, and of repeated doses of N, P, K, and Ca, in varying combinations and amounts, on *Populus robusta* 'Lampertheim'.

1589. **[A study tour of the Nederlandsche Boschbouw Vereeniging in the German forest districts of Erdmannshausen and Syke.]** *Ned. Boschb.-Tijdschr.* 28 (1; 3), 1956 (2–17; 55–9). [G. or Du.]

Contains papers in German on methods used (1) at Erdmannshausen—'natural' forestry based on conversion to mixed, uneven-aged forests, little or no soil cultivation or use of fertilizers, limited use of liming, careful choice of species, from a study of natural plant associations; and (2) at Syke—soil improvement by liming, green manuring, and application of fertilizers (*Volk* and *Hassenkamp* respectively); and papers in Dutch (*C. P. van Goor* and *A. van Laar; J. J. M. Jansen; J. L. W. Blokhuis*) on the two methods and their relevance to conditions in the Netherlands.

1590. JELEM, H. Walddüngungsversuche in Deutschland. Ein Reisebericht. **[Forest fertilizer trials in Germany. Report on a study tour.]** *Allg. Forstztg.* 66 (13/14), 1955 (163–7). 3 refs. [G.]

Includes descriptions of P fertilizing of Spruce on raised bog in Bavaria, trials on various bunter sandstone soils in the Schwarzwald, e.g. to promote natural regeneration of Silver Fir and Pines, Poplar fertilizing trials on spoil mounds near Cologne, fertilizing and intercropping methods tried on silt loams near Bremen, and phosphate treatment of Spruce on gley-podzol-type soils in the Ardennes (Belgium), most of which have been, or will be described in the literature.

1591. FREYENHAGEN, H. Der Einfluss von Bodenbearbeitung und Düngung auf die Erträgnisse beim Flurholzanbau. **[The effect of soil cultivation and fertilizing on wood yields outside the forest.]** *Holzzucht, Reinbek* 9 (1), 1955 (4–5). [G.]

In trials at Vorwerksbusch (Reinbek) careful hoeing nearly doubled the height and diameter of 1-year rooted cuttings of *Populus* 'Bachelieri Wolfgang'. Treatment of *Salix viminalis* × *S. purpurea* beds on sandy loam with marl, marl containing Mg, and basic foundry slag (crude $CaSiO_3$) revealed no clear differences between the fertilizers. All increased yields to twice or three times that of controls for the first 4 years at dosages equivalent to 1500 and 3000 kg./ha. of CaO.

1592. FRANZ, H., JELEM, H., and FINK, J. Untersuchungen zur forstlichen Standortsverbesserung. **[Trials in forest site improvement.]** *Mitt.*

forstl. VersAnst., Mariabrunn No. 53, 1956. pp. 88. 30 refs. [G.]

A preliminary report on five trial areas, mostly started in 1952, on more or less degraded sites: 4 in Upper Austria and Styria, stocked with poor mature Spruce and some admixtures, and one in the Wienerwald with poor Beech and Oak. Topography, soils and vegetation are described. Treatments consisted chiefly of liming with $CaCO_3$ or CaO, with or without planting of lupins, and the main aim was regeneration, either natural or assisted by sowing of Silver Fir or planting of Beech. Effects on soil and vegetation are described. Though initial results, particularly of CaO, were promising and no adverse effect on soil micro-organisms was found, it is concluded that liming alone will not in most cases prove effective. Further research with N and other fertilizers is advocated.

1593. **[The effect of fertilizer on diameter increment of different species.]** *Korte Meded. Bosbouwproefsta., T.N.O., Wageningen* No. 26, 1956 (8–9). [Du.]

Sample plots in forests near Arnhem, treated some 15 years earlier with city refuse, showed greatly increased pH values (pH 6–7), substantial increases in total N (although soluble N remained low) and increased phosphate contents. Mean annual-ring breadth of 70-year-old Beech in normal closed stands increased after treatment from 0·4–0·8 to 1·2–2·6 mm. and that of 140-year Red Oak from 1·0–1·8 to 3·6–5·0 mm.; the higher values have been maintained throughout the 15 years since treatment. Scots Pine, however, showed wide variations in annual-ring breadth, with no difference between treated plots and controls. [Cf. *F.A.* 14 No. 2201.]

1594. Trümper, K. H. Sind die Erträge unserer ersten Fichten-Ertragsklasse die höchstmöglichen? **[Are yields from our site-class-I Spruce the best possible?]** *Forstarchiv* 26 (6), 1955 (134–5). 1 ref. [G.]

Additional suggestions for liming, based on an article by Lohwasser [see *F.A.* 15 No. 3554]: (1) Liming need not be postponed till planting but can be carried out 30–50 years earlier, so increasing stand increment and allowing mull to form. (2) 'Burning' slash with CaO for 1–2 years is cheaper and more beneficial to the soil than burning by fire. (3) The amount of lime to be introduced depends on e.g. soil acidity and absorption capacity, the species, and altitude. (4) The minimum fertilizer dose is 100 g. basic slag per planting hole, or 500 kg. at 4000–5000 plants/ha. (5) The results achieved, viz. increasing annual increment by 49%, can probably be improved still further. Norway Spruce, planted in 1932 in Fredeburg, Hochsauerland on a site of class III–IV with 150 g. basic slag to each planting hole had a m.a.i. of 6–7·1 cu.m./ha. between the first and second thinnings. A proposed application of 5000 kg. CaO/ha. is expected to increase this to 10 cu.m./ha. (6) It is believed that liming alone cannot prevent soil degradation in pure conifer stands; fertilizers and the right plant associations are more effective.

1595. Meshechok, B. Om myrgjødsling for skogproduksjon. **[Applying fertilizers to bogs for timber-growing.]** *Tidsskr. Skogbr.* 64 (3), 1956 (119–48). 24 refs. [Nor.]

Cites data collected by various European research workers on the content of mineral elements in living trees and on the minimum consumption by the forest of N and ash elements (amounts of these nutrients in the trees, in 2 years' accumulation of litter, and removed in thinning). A comparison of the figures for nutrient consumption with the nutrients available in wood ash from wood-fired board and pulp mills, showed that such ash is not an ideal fertilizer; it can be used at the rate of ca. 3 tons/ha., but later applications of P and K will be necessary. Results of analyses made by Det norske Skogforsøksvesen in 1954–55 of nutrients found in the top 40 cm. of 3 'soligenous' [water derived from seepage from surrounding land] and 2 'ombrogenous' [water derived from direct precipitation] bogs showed that fertilizers for ombrogenous peats should contain N (in the first application), Al, Mn, Ca, P, Mg, K and S, and for soligenous peats N (in the first application), Mn, Mg, K and, on some sites, Ca, P and S. Recommendations are made, based on results from the 5 sites examined, for complete fertilizers for initial treatment of Spruce and Pine planted on ombrogenous and soligenous peats. Results are given in graphs and tables.

1596. Tamm, C. O. Studier över skogens näringsförhållanden. 3. Försök med tillförsel av växtnäringsämnen till ett skogsbestånd på mager sandmark. **[Studies on forest nutrition 3. The effects of supply of plant nutrients to a forest stand on a poor sandy site.]** *Medd. SkogsforsknInst., Stockh.* 46 (3), 1956. pp. 84. 45 refs. [Sw.sw.e.*e.*] Price *Kr.*4.

[Cf. *F.A.* 16 No. 3769.] A report on fertilizer experiments in 30-year-old Pine stands (Mölna experimental area) with some Spruce and Birch. In plot (*a*) different amounts of NH_4NO_3 were given in 1951, in (*b*) the composition of the fertilizer was varied from a balanced mixture of all main nutrients to combinations of some only ('minus experiment'). The N response of Pine followed a well-known pattern, being greatest in the 2nd summer after treatment. It was less marked in dominants than in the lower tree-classes, indicating a greater initial deficiency in the latter, the possible causes of which are discussed. The effect of N on the other species, though not measured, was clearly visible. Results of (*b*) were not quite clear; trace elements appeared to have certain adverse effects, possibly because of wrong dosage. Changes in foliar nutrient content were investigated and compared with increment and fertilizer dosage. Under the conditions of the experiment, optimum diameter growth appeared to be linked with an N content of 2–2·5% of dry weight in Pine needles, with similar figures (estimated) for Birch and Spruce.

The complex relationship governing nutrient contents, and the use of foliar analysis as a diagnostic method with reference to deficiency levels are discussed. Three appendixes deal with the variations in composition between foliage from similar branches of the same and of different trees, between the current and previous year's needles of Pine

and Spruce, and between the leaves of *Betula verrucosa* and *B. pubescens*. There is an 11-page English summary. *From author's summary.*

1597. TAMM, C. O. Studier över skogens näringsförhållanden. 4. Effekten av kalium- och fosfortillförsel till ett oväxtligt bestånd på dikad myr. **[Studies on forest nutrition 4. The effects of supply of potassium and phosphorus to a poor stand on drained peat.]** *Medd. SkogsforskInst., Stockh.* 46 (7), 1956. pp. 27. 20 refs. [Sw.sw.e.*e.*] Price *Kr.*2.

Reports on fertilizer trials with K_2SO_4 and/or P in various forms, started in 1953 on a drained peat-moor near Salsta, Uppland, Sweden, that was rich in C and N, but poor in K and P, and carried Birch and Pine with an understorey of chlorotic Spruce. All species showed improved colour, and Spruce also increased height growth (the other species were not measured) on the K and KP plots, whereas the effect of P alone was, if anything, unfavourable. Chlorotic Spruce needles and the foliage of Birch and Pine before treatment contained little K. The uses of foliar analysis for diagnosing nutrient deficiencies of soils, and the practical application of the test results are discussed, but pending further information on the duration of the fertilizer effect, no recommendations for treatment are made.

1598. WHITE, D. P. **Aerial application of potash fertilizer to coniferous plantations.** *J. For.* 54 (11), 1956 (762–8). 22 refs.

In Lewis and Oneida County, New York State, 9 plots of mixed conifer stands, totalling 109·3 acres, were dusted from the air with a granular grade of KCl (60% K_2O) at 200 lb./acre. The equipment and method of application are described and details given of the time taken. Cost of materials and application averaged $13/acre. *Picea glauca, P. abies, Pinus strobus* and *Pinus resinosa* showed a definite colour response and an increase in needle length and foliage production compared with controls. Analysis after two growing seasons showed an increase in K of 20–77% in the leaves and 48–118% in the soil. Mg deficiencies in *Pinus sylvestris* seemed to be accentuated after application of K.

1599. **Eucalypt studies.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55*, 1955 (31).

(1) Nutrient status of the soils of the *Eucalyptus polyanthemos/E. melliodora* and the *E. melliodora/E. blakelyi* associations: Soils from 5 of each of the associations have been shown to be deficient in N, P, and S. Yield was depressed by application of K and no response was obtained with minor elements. Soils of the first association contained significantly higher levels of available P. (2) Nutrition of *E. polyanthemos* and *E. melliodora*: The response to Ca, N, P, K, S, and $CaCO_3$ was investigated in sand culture. $CaCO_3$ depressed growth in both species. *E. polyanthemos* responded to all elements, *E. melliodora* only to Ca, N, and P. Both species responded more to P than to N. A similar trial has been begun, using *E. fastigata* and *E. bicostata.* The depressing effect of $CaCO_3$ has been established, and responses to P, N, S, and K appear likely.

238. Timber Plantation Crops requiring Special Treatment

See Nos. 1436, 1579, 1591.

24. Tending of Stands and Trees

See also Nos. 1475–6.

242. Thinnings

See also Nos. 1908, 2002, 2022, 2048.

1600. Intensivierung der Durchforstung. **[Intensification of thinning in Austria.]** *Allg. Forstztg.* 66 (9/10), 1955 (113–26). 49 refs. [G.]

A special number devoted to the problem, chiefly from the aspect of pulpwood supplies, including articles on: peasant forests (*O. Eckmüllner*); thinning, opening-up, and transport (*F. Hafner*); increased pulpwood supply through intensified thinning (*J. Jankowitsch*) [warning against over-optimism]; increasing volume yields by tending (*M. Schreiber*) [surveying German literature, and stressing the effects of site and climate]; and increased volume yield through thinning and opening up (*H. Schmied*) [containing provisional data from 15 Austrian trial plots for Spruce, Beech, and Austrian Pine, covering 50–64 years]. [Cf. *F.A.* 18 No. 2022.]

1601. SINGH, P. **Basic thinning.** *Indian For.* 81 (1; 2), 1955 (26–31; 86–97).

Discusses the nature of thinnings in relation to laws of growth, proposes a system of tree classification based on crown freedom (in place of tree dominance), and develops thereon a series of thinning grades.

1602. SAGREIYA, K. P. **Practicable thinnings (in naturally regenerated young crops of Teak).** *Indian For.* 82 (11), 1956 (553–61 + 1 gph.). 5 refs.

The paper describes a practicable method of thinning irregular young crops of Teak, of coppice, seedling-coppice and seedling origin, with the help of intelligent forest guards and labourers. It prescribes selection of the best stems and then giving each of them the optimum growing space, according to the formula

$$D = 1{\cdot}5\,(d + 4)$$

where D is the diameter of the growing space in feet, and d the diameter of the stem in inches. Accordingly, two adjacent stems of diameters d_1 and d_2 inches are considered as ideally spaced when the distance between them is equal to

$$1{\cdot}5\left\{\frac{d_1 + d_2}{2} + 4\right\}\text{feet.}$$

To check that thinnings of the desired intensity have been made, it is suggested that small plots be laid out and the arithmetical mean diameter of élites determined and checked against the approximate formula—

$$N = \left(\frac{150}{X + 4}\right)^2$$

where N is the number of stems per acre [and X the mean diameter?]. It is emphasized that due allowance should be made for vacant spaces which are likely to be left wherever the original crop is not fully stocked. *From author's summary.*

1603. BRAATHE, P. Forholdet treantall—høyde som tetthetsangiver. [**The relation between number of trees and height as a stand-density index.**] *Tidsskr. Skogbr.* 63 (6), 1955 (231–8). [Nor.]

Discusses the value of the suggested index based on the average spacing between trees as a % of top height [see *F.A.* 15 No. 3560] and derives curves from N. European yield tables for Spruce, showing the variation in density index with increasing top height for different site classes. The curves vary widely, some rising steadily with increasing top height (e.g. those of Wiedemann for medium thinning on a good site class), some rising to a top height of ca. 16–18 m. and then falling (e.g. Norwegian figures for all site classes), some remaining fairly constant after a slight initial rise (e.g. the figures of Hummel and Christie for good and medium site classes) and some falling steadily (e.g. those of Møller for all classes). The Norwegian tables of Eide and Langsæter were used to calculate the b.a. increment for site class A for a constant density index value of 1·75. The b.a. increment was lower and the total yield less than for thinning grade I. Figures for 6 plots in a plant-spacing study at Fossum showed that curves for density index drew together during the period of observation, as a result of thinnings, values ranging from ca. 1·2 to 2·5 at 19 m. top height and from 1·49 to 2·02 at 24–26 m. Tabulated figures show the number of trees and the % value for index values 0·25 to 4·00, top heights 8–28 m. The author concludes that the index is extremely valuable for research and demonstrations and that it may serve as a simple thinning guide; further research is, however, needed.

1604. ASSMANN, E. Durchforstungsstärke und Zuwachsleistung. [**Thinning intensity and increment.**] *Forst- u. Holzw.* 11 (17), 1956 (364–70). [G.]

An analysis of data from (*a*) 3 Oak trial plots near Eberswalde and (*b*) Bavarian Spruce thinning trials, both covering ca. 60 years, in support of the author's theory of high optimum densities. From a graphical method of interpolation for (*a*), it is concluded that the optima lie, with increasing age, progressively nearer the maximum ('A'-grade thinning) and that the critical density (where c.a.i. $\geqslant$ 95% of the maximum) lies well above that for C-grade thinning, though early stimulation of growth by this grade is admitted. Wiedemann's yield tables and the quasi-natural school are criticized.

1605. BONNEMANN, A. Eichen-Buchen-Mischbestände. [**Mixed stands of Oak and Beech.**] *Allg. Forst- u. Jagdztg.* 127 (2/3; 5/6), 1956 (33–42; 118–26). 4 refs. [G.g.e.]

A yield study on 3 pairs of Eberswalde sample plots in the Westerwald, established in 1881 in even-aged mixed stands, then 40, 52 and 68 years old, to ascertain the effect of heavy crown thinning on selected Oaks; first reported on by Wiedemann in 1931. In the youngest plots the number of favoured Oaks was 170 and 180, in the others 70 to 80 per ha., but the highest numbers could not be maintained. On the plots where Oak was favoured, its standing volume is now greater, and that of Beech smaller, than in the lightly thinned series; total volume increment was 4–7% smaller, total mean b.a. increment about equal, but on the crown-thinned plots that of Oak is proportionately much greater. Value increment, calculated on pre-war prices used by Wiedemann, is 2, 6 and 16% higher on these plots, but using 1952–53 prices, which are more favourable to Beech, the differences tend to even out. It is not expected that the future development of the plots will present a different picture.

1606. LORNE, R. À la recherche de la qualité et du gros diamètre dans les futaies de chêne. [**In search of quality and large diameters in Oak stands.**] *Rev. for. franç.* 8 (11), 1956 (754–68 + 7 photos). [F.]

Discusses the type of tree in demand by the timber industry, analyses the growing stock on sample plots in four French Oak forests (120–190 years), concludes that only 1·1–3% of existing trees would give class-1 sawlogs, and considers methods of improving this state of affairs by thinning from above.

1607. MCKNIGHT, J. S. **Thinning our young Gum.** *Forests and People, Alexandria, La.* 6 (3), 1956 (28–9).

A note on a recently started study of thinning *Liquidambar styraciflua*, with the object of improving the thousands of acres of young stands in Louisiana.

1608. **Thinning experiments [in *Acacia decurrens* var. *mollissima*].** *Rep. Wattle Res. Inst. S. Afr. 1955/56*, 1956 (13–4).

These are laid down to 7-, 9-, 11-, and 13-year rotations, and some of the 51 plots of the first, with densities of 500–1000/acre, have been harvested. For the site and for this rotation, peaks of mean tannin content and acre yields of green bark and tannin are at 700 trees/acre and though this is not significantly superior to all other densities, the optimum probably lies near it. Bark quality in this short rotation was well below the standard minimum. [Cf. *F.A.* 16 No. 3008.]

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 1765 *et seq.*, 1908.

1609. SHOULDERS, E. **Timber stand improvement in Ozark forests—an appraisal after 15 years.** *J. For.* 54 (12), 1956 (824–7).

In 1934–35, C.C.C. crews carried out stand improvement work in N. Arkansas on sites of *Pinus echinata* and of *Quercus alba*, *Q. falcata* and *Q. coccinea*. Both the hardwood and the conifer stands had a large proportion of hardwood culls. The main object was to release the younger trees, and treatment consisted of girdling culls and cleaning round selected crop trees. In 1950 on 72 pairs of ⅕-acre plots, one of each pair inside and the other outside the treated area, stems larger than 0·5 in. in d.b.h. were tallied and classified for economic

desirability. Treated hardwood stands had a b.a. of 16·2 sq. ft./acre of valuable wood, compared with 9·1 sq. ft./acre in untreated stands, the improvement being most marked in the understorey. On Pine sites, where treatment was light, a slight improvement was seen only in the understorey, which had a b.a. of 5·7 sq. ft./acre of valuable wood, compared with 3 sq. ft./acre on untreated sites. Pines released in 1935 were soon suppressed again by hardwood coppice. The stands would have been improved still more if the mature merchantable timber had been harvested before treatment, if more culls had been removed and chemicals used against coppice shoots.

1610. RUSHMORE, F. M. **A small quantity of sodium arsenite will kill large cull hardwoods.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 83, 1956. pp. 6. 4 refs.

In July 1951, 50% solutions of Na arsenite (2, 4, 10 ör 14 c.c.) or Ammate (8, 16, 24 or 32 c.c.) were injected into 3 trees each of *Fagus grandifolia*, *Betula lutea* and *Acer saccharum* in holes $\frac{7}{16}$ in. diam. and 2 in. deep, bored at 8-in. intervals round the boles, 30 in. above ground. The minimum effective dosage per hole was 2 c.c. Na arsenite or 16 c.c. Ammate, which killed 90% of the Beech and Birch and at least 80% of the Maple within 3 years. With Ammate some crown recovery occurred. Basal sprouting was short-lived. [Cf. *F.A.* 17 No. 418.]

1611. HÄGGSTRÖM, B. Några fickningsförsök med hormonpreparat på björk. **[Some experiments on the use of growth regulators in notches in Birch.]** *Norrlands SkogsvFörb. Tidskr.* 1956 (2), (239–49). 5 refs. [Sw.sw.]

Trees of *Betula pubescens* were notch-girdled at a point below the lowest green branch, and the notches filled with 2,4-D, 2,4,5-T or 2,4-D/2,4,5-T preparations. Results show that: (1) triethanol amine salts give a better kill than esters; (2) diluting the preparation with diesel oil reduces the effect; (3) large trees need a larger amount of the preparation per unit area than small ones; and (4) notches should be numerous, e.g. 1 notch per inch of the tree's d.b.h.

1612. DAWKINS, H. C. **Some recent work on arboricides.** *Tech. Note For. Dep. Uganda* No. 21/56 [1956]. pp. 1.

In Uganda the late dry-season flush (characterized by high translocation rate and depleted starch) is probably a better time for application than the period of high temperatures earlier in this season. The 2,4,5-T/2,4-D diesel mixture is justified, but additives, e.g. wetting agents, stickers, emulsifiers, should be tried.

245. Tending of Trees, Pruning etc.

See also Nos. 1683–4, 2073.

1613. FOILES, M. W. **Time required to prune crop trees in the Western White Pine type.** *Res. Note Intermt. For. Range Exp. Sta.* No. 32, 1956. pp. 4. 2 refs.

Time studies showed that 4- to 6-man crews could prune 37 trees/day in an open stand and 16 in a dense stand. Pruning was done with a hand saw, an 8-ft. pole saw and a 14-ft. pole saw.

1614. HALLIN, W. E. **Pruning Ponderosa and Jeffrey Pine.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 115, 1956. pp. 4. 1 ref.

In a 1947 pruning study, 25 groups of 4 *P. ponderosa* or *P. jeffreyi* crop trees were selected (mean diam. 5·4 in.) in an open-grown stand, and in each group 4 pruning treatments were tried, removing (*a*) 0, (*b*) $\frac{1}{4}$, (*c*) $\frac{1}{2}$, or (*d*) $\frac{3}{4}$ of the green crown. Treatment (*c*) is regarded as the most satisfactory; after 5 years the average crown length was reduced from 0·86 to 0·43 of the total tree height. The temporary reduction in growth rate is not significant. In (*d*) 50% of the trees died. Additional recommendations for pruning are: to prune trees as early as possible, though pruning is permissible on trees up to 14 in. in diam., and to leave $\geqslant \frac{2}{5}$ of the total tree height as green crown. A table shows the height to which trees of different d.b.h. can be pruned.

1615. CHILDS, T. W., and WRIGHT, E. **Pruning and occurrence of heartrot in young Douglas Fir.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 132, 1956. pp. 5.

Seven plots were established in 2 planted and 5 natural stands of 19- to 28-year Douglas in Oregon. Four pruning treatments, carried out half in the spring, half in the autumn, were (*a*) removal of all dead branches, (*b*) sawing off dead branches and 1–2 live branch whorls, (*c*) as (*b*) but 4–5 live whorls, and (*d*) sawing off all branches up to 18 ft. In each of (*a*), (*b*) and (*c*) 305 trees were treated, and in (*d*) 120 trees. In addition, after pruning by method (*c*), 41 trees had the basal swelling of the branch removed and 185 trees had branches pruned to 4 in. from the bole. Over a period of 14 years 253 pruned and 50 of 365 control trees were dissected. Of the 45 pruned trees with definite or suspected infection, 31 had been pruned in the spring. Pruning live branches caused a higher % of infection than pruning dead branches. In most cases the extent of decay was slight except for 3 trees badly infected by *Fomes subroseus* and pruned by method (*d*). Slight injury to the cambium at the branch base seems to hasten healing of the wound. Infection among the control trees was negligible.

25. Treatment of Defective, Derelict or Very Open Stands

1616. **[Treatment of degraded Oak wood.]** *Rep. Nat. Conserv., Lond. 1955/56*, 1956 (30).

Yarner Wood has been acquired by the Conservancy as a good example of the state to which the former natural Oak woodlands adjoining Dartmoor have been reduced by centuries of cutting for charcoal, firewood and timber, and by mining, game preservation and planting of exotics. An elaborate programme has been drawn up, including the setting aside of some compartments to be left untouched and others to be used to demonstrate the effects of different treatments: (1) clear felling and planting with mixtures of Oak, Alder and Beech; (2) deep ploughing and planting with Sessile Oak on areas at present almost devoid of tree growth; (3)

ploughing of fire-breaks and planting with Larch; (4) thinning of old Oak coppice by 60% before planting with Sessile Oak, Alder, and Scots Pine, with similar planting in an unthinned plot for comparison.

1617. SÆTHER, R. Økonomiske beregninger for en glissen naturforyngelse. **[Economic calculations for an area of sparse natural regeneration.]** *Norsk Skogbr.* 2 (15), 1956 (493 . . 500, 516). 9 refs. [Nor.]

Presents graphs showing the relation between number of plants per dekare and zero squares; yield from sparse regeneration as a % of normal yield in relation to age; prognosis of future yields with different thinning intensities; mean diameters; price in relation to mean diameter and age; and future receipts from intermediate and final yields for different rates of interest, for the different thinning intensities, and when such sparse areas are felled and planted. Gives some examples of calculations to determine where such felling and replanting is economically justified.

1618. JARVIS, J. M. **An ecological approach to tolerant hardwood silviculture.** *Tech. Note For. Br. Can.* No. 43, 1956. pp. 43. 14 refs.

Summarizes the findings of a survey of poor-quality mixed hardwood stands in the Great Lakes/St. Lawrence forest region. The ecological characteristics of the hardwoods in each physiographic district are described, and recommendations made for their silvicultural management and improvement. *Acer saccharum* is the dominant species, and is so aggressive in most areas that it can spread at the expense of other species. The much more valuable Yellow Birch is unable to compete successfully with it and should be favoured by seedbed preparation and release.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

1619. ALJBENSKIĬ, A. V., and NIKITIN, P. D. Agrolesomelioracija. **[Forestry in agricultural improvement.]** Seljhozgiz, Moscow. 3rd ed. (rev.), 1956. pp. 744 + 1 sketchmap, 3 dgms. 14 pp. of refs. [Russ.] Price *Roubles* 11·70.

A rearranged and enlarged edition of the work noticed in *F.A.* 8 No. 1772, with chapters, written by various specialists, on: the development of protective tree-planting; natural conditions of the steppe and forest-steppe regions of the U.S.S.R.; suitable species and types of mixture; significance of shelterbelts (shelterbelt influences); location of, and technique of raising and tending, shelterbelts; protective plantations for irrigated agricultural areas; soil erosion and its control; erosion and its control in mountainous regions; sands and their reclamation for forestry and agriculture; amenity plantings for agricultural settlements; improvement of collective-farm woodlands; seed husbandry; nursery practice; control of diseases and pests; mechanization of operations; and planning and organization of forestry work on collective farms.

261. Alternate Forestry and Agriculture. Periodic or Temporary Agricultural Use of Forest Land

See Nos. 1245, 1588.

264. Farm Forests

See also Nos. 1600, 2022.

1620. HEIKURAINEN, L. Yksityismailla suoritettujen metsäojitusten nykyinen tila. **[The present state of drained areas in farm forests.]** *Metsät. Aikak.* 1956 (6/7), (198–205). 7 refs. [Fi.e.]

A 2-year survey on areas drained in the 1930's indicated that 46% of them were well drained, 43% satisfactorily and 11% poorly drained. Of the ditches, 31–34% were in good, 42–46% in satisfactory and 20–27% in poor condition, mainly because of neglect. Only 36–39% of the forests were satisfactory silviculturally, 44–47% were unsatisfactory but capable of improvement and 17% so badly understocked as to need reforestation. About half of the drained forests had been neglected for 20 years, especially as regards regeneration fellings and other methods of ensuring regeneration. Improvement of young stands should be carried out on 43,000 ha. of the 380,000 ha. examined, intermediate fellings on 209,000 ha., regeneration fellings on 34,000 ha. and sowing and planting on 23,000 ha. *From author's summary.*

266. Shelterbelts, Windbreaks

See also Nos. 1437, 1571, 1619, 1801, 1817, 1852.

1621. DEJMAL, J. Biologická ochrana komunikací před závějemi. **[Biological protection of lines of communication against snow drifts.]** *Lesn. Práce* 35 (2), 1956 (82–7). [Cz.]

Discusses in general terms the functioning of shelterbelts erected on either side of roads and railways; quotes the results obtained by some Soviet workers [Bodrov, Koteljnikov, Lunc [sources not cited]]; gives a diagram taken from Lunc's work, showing the effect of the degree of shelterbelt permeability on the deposition of snow between the belt and the road, and another diagram showing the design of a shelterbelt; and finally refers to 'Instructions for establishing and tending shelterbelts' published in 1954 by the Czechoslovak Ministry of Forests and Timber Industry.

1622. KREUTZ, W., and WALTER, W. Der Strömungsverlauf sowie die Erosionsvorgänge und Schneeablagerungen an künstlichen Windschirmen nach Untersuchungen im Windkanal. **[Studies of air flow, erosion and drifting snow, with artificial screens, in a wind-tunnel.]** *Berichte des deutschen Wetterdienstes, Bad Kissingen* 4 (24), 1956. pp. 25. 8 refs. [G.g.] L.M.O.

Describes the experimental set-up and the screens used—metal, coco-fibre, or wooden hurdles, and discusses the influence of surface, permeability, size and distribution of openings, shape of edges, closeness to the ground, and ground configurations, and the applicability of findings to field conditions.

Optimum shapes for wind protection and erosion control differ from those for protection against driving snow.

1623. EIMERN, J. VAN. Über Schwankungen der Windschutzwirkung von Hecken und Baumreihen. **[Variations in the windbreak effect of hedges and rows of trees.]** *Meteorologische Rundschau, Berlin* 8 (7/8), 1955 (122–7). 6 refs. [G.g.] L.M.O.

Gives first results of experiments in flat, open country near Hamburg, designed to test the influence of various factors, e.g. temperature gradients in the air, on the reduction of wind velocity by windbreaks. From 20 May to 31 July 1955 several readings a day were taken for 13 points at 1·5 m., and 4 points at 3 m., from the ground, at distances of 6–260 m. from a double row of Maple, 12 m. high, spaced 6 m. between and 10 m. in the rows, flanked by 2 rows of lower trees and bushes, and running N.–S. Reductions in wind velocities measured as a % of unobstructed wind (taken as the reading at 260 m. distance) varied widely, and not uniformly for all points, with wind direction and force, and with time of day. Mean relative velocities during the day were lower near the obstacle, but higher at 100 m., than at night. Readings fluctuated widely at all points, and the danger of drawing conclusions from any short series of measurements is emphasized.

1624. POPOV, V. V., and MEDVEDEV, D. V. Meroprijatija po povyšeniju gidrometeorologičeskoï effektivnosti polezaščitnyh lesnyh polos. **[Measures for increasing the hydrological and meteorological effectiveness of shelterbelts.]** *Soobšč. Inst. Les.* No. 1, 1953 (77–81). [Russ.russ.]

Experiments in Rostov and Voroshilovgrad regions showed that by cutting down the dense outer rows of shrubs (*Elaeagnus angustifolia* and *Prunus mahaleb*), permeability (i.e. the % ratio of wind velocity at the leeward margin of the belt to that in the open steppe) was increased from 3–14% to 35–67% when the trees (4–6·5 m. high) were in leaf, and from 6–20% to 47–72% after leaf-fall. Shelterbelts without borders of shrubs had a high permeability. From these and other experiments, it is concluded that the dense border shrubs of 5- to 7-row shelterbelts should be thinned by 50% every 2 years (if alternate shrubs are cut, they will coppice in this period and the intervening shrubs can then be cut in turn). For wider shelterbelts, the shrub borders should be clear cut every 2 years. Groups of coppice inside the stands should also be thinned, but density of canopy must not be reduced below 0·6–0·7; the shrubby underwood, however, should be removed. Pruning to a height of 2 m. (but $\geq \frac{1}{3}$ of tree height) or, in young stands, brashing, is also advised.

1625. CATRINA, I. Contribuţii la cunoasterea acţiunii perdelelor de protecţie asupra microclimei. **[The effect of shelterbelts on the microclimate.]** *Rev. Pădurilor* 70 (9), 1955 (395–402). 8 refs. [Rum.]

Gives the results of measurements of the effects of a shelterbelt of Elm 5 m. high and 10 m. wide, oriented E.–W., upon wind velocity, air temperature and relative humidity, evaporation and illumination, at different distances from the belt.

1626. LUPE, I., CATRINA, I., and MARCU, G. Influenţa perdelelor de protecţie asupra recoltetor de grîn şi ovăz în Bârâgan şi Dobrogea în anii 1952–1953. **[The influence of shelterbelts on yields of wheat and oats in Bârâgan and the Dobrudja in 1952 and 1953.]** *Bul. şti. Acad. Repub. rom. (Sect. Biol.)* 8 (1), 1956 (199–208). 6 refs. [Rum.rum.russ.f.*f.*] O.R.S.

In normal climatic conditions, the increase in yield of wheat protected by shelterbelts was 350 kg./ha. or 20% in the Dobrudja steppe and 550 kg./ha. or 50% in Bârâgan, compared with yields in unprotected fields. The increase for oats in Bârâgan was 150 kg./ha. or 18%. Yields of wheat (but not of oats) immediately adjacent (up to 16 m.) to the shelterbelt were lower than in the open field. The maximum zone of protection occurred at 25 m. from the belts. In these conditions, optimum distance between belts is 250–300 m.

1627. POPOV, V. V., and KARPOV, V. G. Nekotorye sposoby rekonstrukcii polezaščitnyh lesnyh polos v kolhozah i sovhozah stepnoï zony. **[Some methods of rehabilitating shelterbelts on collective and state farms of the steppe zone.]** *Soobšč. Inst. Les.* No. 1, 1953 (74–6). [Russ.]

Treatments are suggested for unsatisfactory shelterbelts, mainly planted between 1931 and 1941, in the Stalingrad, Rostov and Voroshilovgrad regions, e.g. pure Robinia, *Fraxinus pennsylvanica* or *Acer negundo*, or stands where these or similar species have crowded out the main species—Oak: (1) Establishment of new, wider belts of suitable species in the shelter of the old stand, which should then be removed. (2) For wide belts composed of unsuitable species, complete replacement by successive clear-strip fellings, stump grubbing and replanting or sowing. (3) Where the stand consists of species satisfactory as auxiliaries, introduction of the main species (chiefly Oak) by sowings on clear-felled, stumped strips 3–4·5 m. wide, and thinning the intermediate strips to give sufficient light.

1628. TYMKO, M. M. Greckiï oreh v polezaščitnyh polosah Moldavii. **[*Juglans regia* in shelterbelts in Moldavia.]** *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 21 (9), 1956 (32–5). [Russ.] A.P.B.

Includes growth data for *J. regia* in a 4-year-old shelterbelt on the Beltsy steppe, with alternate pure rows, at 2·5 m. spacing, of *J. regia* (sown direct in nests of 3 seed-spots, the nests spaced 3 m. apart) and Lombardy Poplar [spacing not given]. Very brief notes are also made on some other young plantations of *J. regia* in Moldavia.

1629. JOACHIM, H. F. Erfahrungen bei der Anlage von flurschützenden Gehölzen in der ČSR und ihre Auswertung. **[The establishment and evaluation of shelterbelts in Czechoslovakia.]** *Dtsch. Landwirtsch.* 7 (10), 1956 (507–10). 1 ref. [G.]

A report on the establishment of shelterbelts, chiefly south of Brno and Bratislava, in the past 10 years. A brief account is given of machine-planting methods, and species and combinations used. It is important to eliminate competing ground flora 2 or 3 times annually during the first few years of the life of the shelterbelt.

1630. BODEUX, A. De l'utilité, en Campine, de rideaux-abris contre le vent. **[The utility of windbreaks in Campine.]** *Bull. Soc. for. Belg.* 63 (11), 1956 (463–76). [F.]

Makes suggestions for orientation, composition, and suitable species for shelterbelts in this part of Belgium, where the large unenclosed fields are swept by drying N. and N.E. winds in spring and by S. or S.W. winds at other seasons.

1631. GERHARD, H. Bewährte Windschutzanlagen in Schleswig-Holstein. **[Windbreaks in Schleswig-Holstein that have stood the test.]** *Holzzucht, Reinbek* 10 (1), 1956 (1–3). [G.]

Discusses experiences with various species in the N.W. part of the country, and particularly the effect of the bad year 1954–55, characterized by frequent changes between frost and thaw, gales and late frosts. The most resistant trees were *Populus canescens*, *Ulmus montana* and *Salix alba*, and hedge species, *Sorbus aucuparia*, *Prunus padus*, *Crataegus* sp. and *Quercus* sp., *Salix cinerea* and *Syringa vulgaris*.

1632. GRÖHN, W. Schwarzkiefern und Graupappeln als Windschutzpflanzen. **[*Pinus nigra* and *Populus canescens* for windbreaks.]** *Holzzucht, Reinbek* 9 (3/4), 1955 (25–6). [G.]

Reports on the successful establishment and growth of *P. nigra* var. *austriaca*, ball-planted at 80–100 cm. high, on poor inland sand dunes near the S.W. coast of Schleswig-Holstein, and suggests using this species (preferably with *Syringa vulgaris*) and Grey Poplars in the traditional windbreaks of the region.

1633. UHLIG, S. Windschutzanlagen auf der Hohen Rhön. **[Shelterbelts on the Hohe Rhön.]** *Mitteilungen des Deutschen Wetterdienstes, Bad Kissingen* No. 9, 1954. pp. 17. 5 refs. [G.g.] L.M.O.

A report on the state, in 1953, of the shelter plantings, dating from 1936–42, on this mountain (700–900 m. high), and particularly of a system of belts, each ca. 50 m. wide surrounding fields of 250 × 1000 m. Of the hardwoods (ca. 10% of the belts) only a few, widely spaced, battered little trees remain, incapable of giving any protection. Spruce belts had fared better, though wind gaps are frequent and tend to widen. Damage by man and cattle can also be observed. Heights vary from 4–5 m. in the lower to 1·5–2 m. in the higher parts. Measurements of wind ⊥ or ∥ to the main direction (S.W.–N.E.) of the belts showed that areas enjoying at least 30% of the desired reduction of wind velocities were < 20% of the total. Though it is expected that these areas will extend as the belts mature, a system of intermediate hedges is considered necessary; but even then the original plan of creating conditions for settlement is not likely to succeed.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 1392, 1560, 1588, 1752, 1770 *et seq.*, 2348–9.

1634. REYNOLDS, H. G., and BOHNING, J. W. **Effects of burning on a desert grass-shrub range in Southern Arizona.** *Ecology* 37 (4), 1956 (769–77). 17 refs.

A study was made of the effect of a single summer burn on the reproduction of undesirable shrubs and desirable grasses. Mesquite (*Prosopis juliflora* var. *velutina*), the most undesirable species, was reduced only by 9%; of the few trees killed, all had basal stem diameters < 6 in.; all trees with stems < 2 in. were affected by burning, but 60% coppiced.

1635. MOINAT, A. D. **Comparative yields of herbage from Oak scrub and interspersed grassland in Colorado.** *Ecology* 37 (4), 1956 (852–4). 6 refs.

This study of a foothills scrub Oak [*Quercus gambelii*] community shows that the yields of herbage average twice as much from the open grass-weed parks between the Oak clumps as from the clumps themselves. The forage under the Oaks is of fairly high quality, being composed almost entirely of blue-grass, while in the parks there are more forbs and drought- and sun-tolerant grasses. With moderate to heavy grazing, there is a definite trend to the less palatable species, while the Arizona fescue and mountain muhly decrease in number and vigor. The results suggest the desirability of further work with records of forage yields from land cleared of Oak scrub and sown with suitable range species. *Author's summary.*

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also Nos. 1473, 1619, 1683–4, 2359.

1636. SCHRAMM, J. R. **A re-examination of plant label problems with some new designs.** *Trees Mag., Ohio* 16 (1; 2), 1956 (6–8, 14, 18, 21; 7–12).

Describes and illustrates various types of labels for use in arboreta etc.

28. Husbandry of Forest Products Other than Wood

See also section 892.

282. Bark Crops

See also Nos. 1608, 1658, 1994.

1637. KHAN, A. H. **The tannin-yielding species, their growth and climatic requirements.** *Pakistan J. For.* 6 (1–3), 1956 (14–29; 78–106; 225). 23 refs.

Lists over 100 species, chiefly trees but including a few herbs and climbers, indicating for the exotics suitable regions for introduction into Pakistan.

1638. CIUTA, G. Recoltarea cojii de salcie pentru tanante în zonele inundabile. **[Harvesting tanbark from Willows on floodland.]** *Rev. Pădurilor* 71 (2), 1956 (105–6). [Rum.]

Tanbark is obtained from 5- to 12-year-old Willows (*Salix viminalis*, *S. triandra*, *S. fragilis*, *S. caprea*, *S. alba* and *S. purpurea*) in the Danube floodplain, *S. alba* being much the most abundant. April to May is the best peeling season, but it is not

practicable to harvest the Willows then, and they are usually cut in February and stacked in a damp place until April, when they are peeled.

1639. DUGELAY, A. Problemas gerais da subericultura na região mediterranea francesa. **[General problems of Cork Oak growing in the Mediterranean region of France.]** *Bol. Junta nac. Cortiça, Lisboa* 18 (214), 1956 (273–8, lxii, 57–62). [Port.e.F.]

1640. DUFOREST, J. Faut-il inciser? **[Should Cork trees be incised?]** *Chêne-Liège* 62 (1542), 1956 (3, 5). [F.]

Discusses the common practice of making 2–3 longitudinal incisions on the boles of Cork Oak after stripping, in order to reduce fissuring on the succeeding crop of bark, and concludes that, when carried out carefully, it has no harmful effects and increases the value of the cork.

283. Fruit and Seed Crops etc.

1641. RODRIGUES, J. FELIZ. Condições actuais de produção, colheita, preparação e consumo da semente do pinheiro manso. **[The present situation in the production, collection, processing and consumption of *Pinus pinea* seed [in Portugal].]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 70–F2, 1956. pp. 16. [Port.] Limited distribution.

1642. VELAY, L. Comment concevoir la reconversion de la châtaigneraie fruitière? **[The reconversion of Chestnut stands managed for the production of nuts.]** *Rev. for. franç.* 8 (12), 1956 (826–33 + 4 photos). [F.]

Explains the social and economic changes that have rendered the 'Chestnut civilization' of the Cevennes obsolete, discusses the possibility of growing high-quality chestnuts for market and, concluding that this requires good and accessible sites, raises the desirability of converting some of the existing derelict stands to coppice.

284. Crops Tapped for Exudations

See also Nos. 1791, 2250.

1643. SCHEUBLE, R. Über Kiefernharzung. **[On resin tapping of Pine.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 52, 1956 (3–43). 31 refs. [G.]

Discusses and tabulates experiments with *Pinus nigra* on (*a*) the efficiency of a number of Austrian and German tapping tools (confirming the superiority of planes over the adze in yield per face area); (*b*) width of faces and freshening intervals (showing that yield varied less than proportionally if freshening intervals were halved or only half a face was freshened); and (*c*) the successful use of IAA and 2,4-D, sprayed on the face in weak solutions. Little difference in yield was found between working up or down the stem. Also discusses the design of tapping experiments, the minimum number of stems per treatment etc.

1644. MARVIN, J. W., and ERICKSON, R. O. **A statistical evaluation of some of the factors responsible for the flow of sap from the Sugar Maple.** *Plant Physiol.* 31 (1), 1956 (57–61). 9 refs. O.R.E.

A multiple regression analysis of data collected over 4 seasons from 3 trees indicated that flows were most closely correlated with twig temperatures on the day preceding them; also with the flow of the preceding day, the temperature of the day of the flow, and the duration of the preceding flow. *From authors' summary.*

1645. DĂMĂCEANU, C. E. Tehnica de cultură şi arealul de răspândire a salbelor. **[Silvicultural technique and possibilities of expanded cultivation of *Euonymus verrucosus* [in Rumania].]** *Rev. Pădurilor* 70 (8), 1955 (324–7). [Rum.russ.]

Summarizes the results of research at the Rumanian forest experiment station since 1951 on the possibility of growing *E. verrucosus* extensively on the forest-steppe and meadow-steppe of the Dobrudja.

286. Osier-Growing

See also No. 1591.

1646. CIRIN, A. Contribuţii la cultura răchitei. **[Osier culture.]** *Rev. Pădurilor* 70 (7), 1955 (343–5). 4 refs. [Rum. russ.]

Notes on growing osiers on floodland or waterlogged land, with some yield data for *Salix rubens* treated by pollarding, or coppicing at a height of 5–10 cm. at age 3 years or 10 years.

1647. KRÜGER, H. Zur Unkrautbekämpfung in Korbweiden. **[Weed control in Osier plantations.]** *Dtsch. Landwirtsch.* 6 (2), 1955 (81–3). [G.]

Reviews shortly various mechanical and chemical methods of keeping down weeds in Osier plantations. In well-established stands, success was obtained with weedkillers having a 2,4,5-T, TCA or $NaClO_3$ base, but further research is needed. Good mechanical preparation of the ground is necessary before establishing plantations. In the first year, frequent and thorough hoeings must be done. When the Willows are firmly rooted, a harrow or mechanical cultivator may be used. In subsequent years a light harrow should be used in spring, followed by a dressing of $CaCN_2$ and later hoeing or cultivating as necessary. Some information on costs is included.

287. Bamboo and Cane Growing etc.

1648. MCCLURE, F. A. **Bamboo culture in the South Pacific.** *Unasylva* 10 (3), 1956 (115–6).

A general survey, urging as a first step a study of the species already growing in the area.

1649. MCCLURE, F. A. **Report on Bamboo utilization in Eastern Pakistan.** *Pakistan J. For.* 6 (3), 1956 (182–6).

Deals with the management, on a sustained-yield basis, of some 700 sq. miles of Bamboo (85% *Melocanna baccifera*) forest in E. Bengal, as a source of raw material for the Karnaphuli Paper Mill.

288. Crops Grown for Animal Products

See Nos. 1276, 1991.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

See also No. 2019.

302. Man and Work (Physiology and Psychology)

See No. 1679.

304. Hygiene. Safety. Accidents and their Prevention

See Nos. 1654, 1675–6, 2122, 2124, 2209.

305. Sequence of Work and Performance (Time and Performance Tables, Evaluation of Work)

See Nos. 1568, 1613.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 1500, 1502, 1522, 1570–1, 1587, 1729, 1755, 1760, 1831, 1847.

1650. Matériels mécaniques et reboisement. **[Mechanized equipment and afforestation.]** *Étude Com. consult. Rebois.* No. 8, 1955. pp. 20. [F.]

Notes on machines for cutting and clearing vegetation, ploughs, rooters, dozers, hole-diggers, and planting machines.

1651. Maschinen für den Bergwald. **[Machines for use in mountain forests.]** *Bündnerwald, Chur* Suppl. No. 6, 1956. pp. 152. [G.]

An illustrated manual for the practical forester, containing articles on new machines and implements for planting, afforestation and tending (*E. Surber; R. Wettstein*); the use of power saws (*R. Wettstein et al.*); development trends in wood transport and extraction, and mechanization of log depots (*H. Steinlin*); mechanized road-building in the mountains (*F. Hafner; J. Hartmann*); and a summing up (*J. Hartmann*).

1652. **Equipment news.** *Unasylva* 10 (3), 1956 (138–40).

Descriptive notes, with photographs, of the Merton overhead loader, capable also of digging, dozing, lifting and hauling (Merton Engineering Co., Feltham, England); the Rotaped tracklaying wheel (Leeford (London) Ltd., London); various saws, including a self-honing two-way (reversible) circular saw blade (Skil Corporation, Chicago), and a portable horizontal bandsaw working without a carriage (Ét. C.D., Puteaux, Seine, France); also subsoilers, a tree planter, a tractor-mounted winch, and earth-moving equipment.

1653. **Equipment Section.** *Unasylva* 10 (4), 1956 (196–8).

Includes notes, with illustrations and specifications, of: a portable power-driven earth auger with a possible working depth of 25 m. (Andreas Stihl, Waiblingen-Neustadt (Württ.) Germany); several tractors; a logging arch for logging hardwoods in difficult country (Isles Forge and Engineering, Coff's Harbour, N.S.W.); a pull-type rotary brush cutter (John Deere, Moline, Ill., U.S.A.); a disc-type barking machine (Cundey's Ltd., Alfreton, Derbyshire); the 'Hystermonomast' fork lift truck (Hyster Co., Peoria, Ill., U.S.A.); and a new patented device, SA-7A/Z, for grinding gangsaw blades at small sawmills (Söderhamns Verkstäder Ab, Söderhamn, Sweden).

1654. Informations sur le matériel. **[Equipment notes.]** *Bois For. Trop.* No. 49, 1956 (67–74). [F.]

Includes notes on the following: A protective sun- and water-proof helmet of cork, foamed rubber and plastic, weighing only 400 g. (Ét. Dupuy-Chautard, 28 Rue de Château-Landon, Paris 10); a number of scarifiers, rooters etc. capable of being attached to crawler-type bulldozers, including the Back-Ripper Preco and Dozer-Ripper Preco (Preco Inc., 6300 E. Slauson Av., Los Angeles 22), Dozer Rooter Esco (Esco Inc., 2141 N.W. 25th Av., Portland, Ore.), and the Fleco Root-rake and Bulldozer (Fleco Corp., Jacksonville, Fla.); a number of chokers, hooks etc. for use in cable skidding; two motor starters, one hydraulic and the other electric (Démarreurs hydrauliques Berger, Argenteuil; Sté. D.E.M., 74 Rue St. Lazare, Paris 9); The Water Mule, an unsinkable, circular, boom or log-pond boat (Coast Metal Works, North Bend, Ore.); and several log-turners, lift forks etc. for handling large logs.

31. Logging and Transport: General

See also Nos. 2154, 2159.

1655. NIKITIN, P. **Lespromkhoz as an administrative and production unit.** *Mimeographed Series, Research Program on the U.S.S.R., New York* No. 48, 1953. pp. 82. 4 refs.

Describes the structure and organization of the 'lespromkhoz', which is concerned with the preparation, primary processing and transport of timber.

1656. KRZESZKIEWICZ. La prospection n éthodique: ses avantages et son influence sur la bonne marché de l'exploitation forestière en pays tropical. **[Systematic surveying: its advantages and effect on efficient forest exploitation in the tropics.]** *Bois For. Trop.* No. 49, 1956 (23–33). [F.e.span.]

Stresses the importance and, in the long run, the economy, of making a complete survey of an area of tropical forest before exploitation begins. The method evolved by a commercial undertaking in the Cameroons consists in first dividing the area into 25-ha. compartments by principal rides running N.–S. at intervals of 1000 m. and secondary rides running E.–W. at intervals of 250 m. Each compartment is numbered and surveyed separately, details being entered on a 1/2000 base map. A

method of showing gradients by a system of arrows (illustrated) is simple to apply and gives valuable data for planning extraction. Exploitable trees in each compartment are also marked. The organization and performance of survey teams, methods of compiling data etc., are described.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

1657. Bielczyk, S., and Eminowicz, A. Próby suszenia drewna przy pomocy ssącej siły korony. **[Experiments in reducing the moisture content of wood through the transpiration of the crown.]** *Roczn. Nauk leśn.* No. 7, 1954 (31–66). 5 refs. [Pol.pol. russ.e.] P.R.

Scots Pine (16 trees ca. 70 years old), Oak (9 trees, ca. 60–70 years old) and Beech (12 trees, ca. 50 years old), with equal numbers of control trees, were subjected, early in April and later in May/June, to (1) cutting all round the bole right to the heartwood (for Beech ½ of the radius), (2) felling and leaving the crown on ('sour' felling), or (3) felling and removing the crown. Method (3) did not appreciably reduce the moisture content (m.c.) of the wood, compared with controls; still less did (1) for Pine, Beech or Oak heartwood, but it slightly reduced the m.c. of Oak sapwood when undercut in April, and much more so when undercut in June. Method (2) reduced the m.c. of Scots Pine sapwood from 60 to 30% during the growth period, but left the heartwood m.c. almcst unchanged; in Oak, the m.c. of the sapwood fell from 86 to 60% during the first 8 weeks only, the heartwood remaining unchanged; in Beech, the m.c. fell from 65 to 45% during the first 4 weeks but not thereafter.

1658. Beebe, C. W., *et al.* **Destruction of tannin during chemical debarking of Oak trees.** *Journal of the American Leather Chemists Association, Easton, Pa.* 51 (6), 1956 (266–70). 6 refs. L.S.

Tests on 20 Oaks, all of which were girdled and 10 of which were, in addition, treated with Na arsenite, showed, after a weathering period of one year, a 50% loss of tannin in the bark of the former, while in the latter changes varied from an 8% gain to a 50% loss. Loss of non-tannins after the As treatment was somewhat greater than that of tannin. It is thought that the loosening of the bark and weathering—very uneven in trees not poisoned —may be the main cause of loss, and not the very small amounts of As found in the bark. [Cf. *F.A.* 17 No. 2847.]

1659. Schäfer, G. Über das Ästen von Überhältern und das Kronenabschussverfahren. **[The preparation of standards for felling by branch lopping and by the crown-blasting method.]** *Forstarchiv* 26 (1), 1955 (11–2). 1 ref. [G.]

Additional suggestions on crown-blasting technique [see *F.A.* 15 No. 3612]. For added security while boring, a metal step with a protective edge should be firmly fixed to the tree, and a 30-cm. drill used to its maximum length before further boring with a 50-cm. drill. The cartridges should be kept separately in a box filled with sawdust, in accordance with police regulations. The simplest method of setting off the explosive is by using a time fuse with a simple igniting device. Branches below the crown are best removed by blasting with a detonator and fuse without preliminary boring. A useful rule of thumb is to wind the fuse 3 times round the branch for every 10 cm. of diameter.

323. Felling and Subsequent Primary Conversion

See also Nos. 1662, 1664–82, 1711–3.

1660. Nylinder, P. Utbytet massaved av tall och gran vid olika apteringsmetoder. **[Yields of Pine and Spruce pulpwood from different methods of marking for cross-cutting.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 3, 1956. pp. 5 + 2 gphs., 10 tbls. 2 refs. [Sw.sw.]

Ca. 1550 trees taken at random from 35 logging districts in S.E. Sweden were marked for cross-cutting for pulpwood by different methods after timber lengths to a 5-in. top diameter u.b. had been removed. Tabulated results show the volume obtained for different standard lengths as a % of 'falling' length [i.e. that obtained when the pulpwood logs are laid off in varying lengths in whole feet to the predetermined minimum top diam.]. The volume obtained for standard lengths of 1, 2, 3 and 4 m. to a 3-in. min. top diam. were for Pine 99, 95, 89 and 82% and for Spruce 99, 96, 92 and 87% of volumes for falling lengths. Marking in both 2- and 3-m. lengths gave the same yield as marking in 1-m. lengths, and marking in both 3- and 4-m. lengths a rather higher yield than marking in 2-m. lengths. Marking to a 2½-in. top diam. u.b. increased yields by 3–5%, the increase being lowest for falling and highest for standard 4-m. lengths. Pine gave consistently lower yields because the length of wood of pulpwood quality was slightly less than for Spruce. For both species, % yield from large and small trees was rather less than from those of medium size.

326. Sequence of Operations (including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)

See No. 1664.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood

See also Nos. 1459–60, 1660, 1760, 2359.

1661. Sløs ikke med virke. **[Don't waste wood.]** *Norsk Skogbr.* 2 (21), 1956 (679 . . . 690). [Nor.]

Consists of 3 papers on waste in Norway during exploitation and transport, and waste caused by damage to trees by browsing, insects and fungi (*H. Gaalaas*); waste in building and methods of reducing it (*O. Birkeland*); and the effects of waste on the economy of the nation and individual industries (*F. Jørgensen*); with discussion.

1662. Whitmore, R. A., Jr., and Jackson, W. L. **Increase your profit in the woods.** *Tech. Pap.*

Cent. St. For. Exp. Sta. No. 151, 1956. pp. 10. 5 refs.

A study of the cross-cutting of 203 Black Oak logs in S. Illinois showed that, with more knowledge and care, the number of Grade-1 logs could have been increased by 11%. Wastage was caused mainly by leaving high stumps and merchantable top material and by unnecessary butting.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

1663. JANICZEK, M., BOBROWICZ E., and FLOTYŃSKI, J. Pękanie surowca sosnowego na zrębach. **[Development of shakes and splits in Pine logs on felling sites.]** *Roczn. Nauk leśn.* No. 9, 1954 (105–37). 7 refs. [Pol.pol.russ.e.] P.R.

Observations made on 72 tree-length logs (mean mid-diameter 26 cm., mean butt diam. 42 cm., mean length 18 m.) lead to the following conclusions and recommendations on the prevention of shakes: (1) logs should never be placed on a clear-felled area with their butt ends facing S.: they are best laid E.–W. near the 'forest wall' on the S. side of the area; (2) under canopy the storage period can be longer than in the open; (3) wherever possible, the logs should be left unbarked; (4) the number and size of shakes are less when logs are placed on the ground, but this cannot be recommended because of the danger of bluestain.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 1673–5.

1664. PUHANE, K. Ein- oder Zweimannarbeit: wie gross ist der Unterschied wirklich? Vergleichende Zeitstudien im Laubholzgebiet. **[One-man or two-man work: how great is the difference? Comparative time studies in a hardwood area.]** *Holz-Kurier, Wien* 11 (49), 1956 (7). [G.g.]

Times taken by 8 workers, working with hand tools, either singly or in pairs, to cut and stack wood in 1-m. lengths in mixed hardwood stands near Vienna (Beech predominating) with mean diameters from 4 to 14 cm. were compared. Savings by 1-man work varied considerably between component operations, averaging about 30% of the time taken by 2-man teams.

1665. OHSAWA, M., and KOJIMA, K. **[A time study on [one-man] chain-saw operations in the natural forest in Hokkaido.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (871–92). 4 refs. [Jap.jap.e.]

Compares in detailed tables the felling and cross-cutting work of (*a*) 3 workers with one large saw; (*b*) 3 workers with one large and one small saw; (*c*) 4 workers with one large and one small saw. It was concluded that (*b*) gave the most even distribution of work, (*a*) and (*b*) the highest log output per man-day, and (*a*) the cheapest log.

1666. HILF, H. H., and ECKERT, K. H. Baumzeittafeln. **[Tree-time tables.]** *Forstarchiv* 26 (6), 1955 (131–4). 2 refs. [G.]

A preliminary report, with tables, on the times taken in felling and trimming Spruce and Beech. Times given for 2-man teams, are to be used as a basis for woodcutters' wage tariffs.

1667. SAMSET, I. Arbeidsundersøkelse og hogsttariff. **[Work studies and felling rates.]** *Norsk Skogbr.* 2 (20), 1956 (659 . . . 670). [Nor.]

Discusses the application of work studies made in Norway in 1950 [see *F.A.* 13 No. 3881] with adjustments for differences between speed of work in the experiment and average speed in practice, and between summer and winter work, for degree of difficulty, and for size of trees. Comparisons of the rate developed by this method with existing rates for Østland and Trøndelag show that the two latter underpay for small and overpay for large trees.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 1500, 1651, 1653–4, 1665, 1760, 2128.

1668. MACLAGGAN, M., *et al.* **Development and trends in logging equipment.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1556 (*B*-1), 1956. pp. 16.

A panel discussion bringing out costing and work-study detail in the use of equipment and procedures for felling, yarding and skidding, barking, and chipping, in the Canadian forests.

1669. GROB, H. Gedanken zur maschinellen Entrindung dünnerer Rundholzsortimente im Wald. **[Mechanical barking of thin roundwood in the forest.]** *Schweiz. Z. Forstw.* 107 (10), 1956 (556–64). [G.f.*f.*]

A description of mobile machine barkers, supported by a table of comparative technical data (in French only) for the best-known Scandinavian makes. It is suggested that these rather expensive machines would best be owned by co-operatives or private firms specializing in barking, and moving from site to site.

1670. **The Kingslaw bark peeling machine.** *For. Equipm. Note, FAO* No. *C*.13.56, 1956. pp. 2.

A mobile machine for peeling pitprops and pulpwood (Mebro Ltd., Buckhaven, Fife, Scotland), is described, with specifications and trial data.

1671. SALMINEN, J. **Barking of small timber with 'Kuori-Peto' barking machine.** *Translation, British Paper and Board Industry Research Association, Kenley* [1956]. pp. 6. 1 tbl. Transl. from *Pap. ja Puu* 37 (10), 1955 (484–9). [See *F.A.* 17 No. 1635.] P.R.

1672. LEVANTO, S. Teräskaarisahojen lujuus tutkimuksen valossa. **[The strength of steel bow saws in the light of research.]** *Metsät. Aikak.* 1956 (6/7), (221–4). [Fi.e.]

Research in 1955 indicated that although steel bows are less strong than wooden ones, they are satisfactory and could be improved still further by the use of first-class steel.

1673. REHSCHUH, D. Ein- und Zweimann-Motorsägen. **[One- and two-man power saws.]** *Forstarchiv* 25 (1), 1954 (24). [G.]

Gives a short description, with performance tables and cost calculations, of 8 saws of German make.

The 2-man Dolmar CK is recommended for felling conifers where the more powerful saws are unnecessary. Bow saws are not recommended for fellings.

1674. HANSEL, E. Erfahrungen mit Einmann-Motor-Sägen. [**Experiences with one-man power saws.**] *Holz-Kurier, Wien* 11 (43), 1956 (1–2). [G.]

Experience in Austria indicates that 4 men, using power saws, can do the work that used to need 5. If piece rates remain unchanged, higher earnings for the worker and a saving on 'social payments' (insurance etc.) for the employer will result. Power saws have proved particularly useful under difficult conditions, e.g. windthrows.

1675. STEINLIN, H. Einsatz von Einmann-Motorsägen in der schweizerischen Forstwirtschaft. [**The use of one-man power saws in Swiss forestry.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 32 (4), 1956 (147–201). 15 refs. [G.g.f.it.e.]

The investigations were made in 6 conifer and one Beech stand under varying site and weather conditions. Mean diameters ranged from ca. 15 to 45 cm. By allotting trees at random and by a planned exchange of men between test teams, extraneous differences could largely be eliminated. One-man power saws proved on the whole somewhat more economical than 2-man saws in both time and running costs; times for preparing and felling were less, except for very large trees, but for cross-cutting they were longer than those for 2-man saws on diameters > 30 cm. Total mean difference for a site was ca. 12%. Both were superior to hand tools, but the axe was often quicker in trimming conifers. As sawing times represent only about $\frac{1}{4}$ of total working time, full utilization would require teams of 4 or 5, but these are considered unsuitable for Swiss conditions, as also are systems where a specialized worker moves from tree to tree over the site. One-man work, though power saws make it technically efficient even with large diameters, causes too much idle time for the machine. Two-man teams are considered a good compromise. Under these conditions, total saving of time through the use of 1-man power saws is estimated at ca. 20% for felling and primary conversion, inclusive of barking but exclusive of transport, and their introduction is considered economically sound where a machine-hour costs no more than a man-hour. This applies to most of Switzerland. The author favours ownership of saws by workers, with financial help from the enterprise, where necessary, and central management for maintenance and repairs. Choice of models, effect on piece rates, work organization, and health are also discussed. While dangers from exhaust gases are considered negligible, those from noise, investigated jointly with departments of the Eidg. Technische Hochschule, and from vibrations, as yet very imperfectly investigated, cannot be quite ruled out.

1676. SUNDBERG, U., *et al.* Buller och koloxid—en fara vid motorsågning. [**Noise and carbon monoxide, dangers in power sawing.**] *Medd. Skogsforsknlnst., Stockh., Ser. Uppsatser* No. 44, 1956. pp. 8. 10 refs. [Sw.sw.e.]

A study of the amount of CO present in the air and in the blood, in different conditions (e.g. felling in areas with few trees or in mixed forest with thick undergrowth) and with 5 different power saws, showed that the danger is negligible except when power saws are tested indoors, or possibly when felling is carried out under branches thickly covered with snow. Noise for all models was above the critical level for deafening, 100 decibels; the use of silencers did not reduce the noise below the critical level, but reduced the power of the saw. Studies on mechanical vibration are not yet complete. Studies on the weight and design of power saws [see *F.A.* 17 No. 473] are briefly summarized.

1677. KAMINSKY, G. Sägeschärfkluppen. [**Saw-sharpening clamps.**] *Forstarchiv* 25 (11), 1954 (268). [G.]

Fifteen makes were tested, of which 3 are recommended—the Universal, the Grassman and the Dietramszeller. Details are given of weight, material and price.

1678. EVERS, E. **Study of matchets.** *For. Equipm. Note, FAO* No. *A*.8.56, 1956. pp. 4.

A survey of the tools used by I.N.É.A.C. workers in the Belgian Congo, made with a view to drawing up specifications for an ideal tool.

1679. WIRTHS, W. Arbeitsphysiologischer Vergleich beim Brennholzspalten. [**Splitting firewood: a comparison of work physiology.**] *Forstarchiv* 26 (8), 1955 (196). [G.]

Respiration and pulse-rates were measured during the splitting of firewood logs (*a*) by hand, with an axe, and (*b*) mechanically, using a cone-shaped wedge with a thread, which can be attached to any turning shaft. The mean consumption of human energy was 6·1 Kcal./min. for (*a*) and 4·3 for (*b*). Time saved by (*b*) amounted to 30%.

1680. Štípání paliva rotačním klínem. [**Cleaving of firewood with a rotating wedge.**] *Lesn. Práce* 35 (2), 1956 (88–9). [Cz.]

Illustrated description of a device for cleaving billets 20–25 cm. long and 15–35 cm. diam. The cleaver proper is a steel cone with a helical thread which is rotated by an electric motor, tractor, or the spindle of a circular saw. It has been tested in West Germany [no results given].

1681. VOROBJEV, I. V., and GALJPERIN, Z. S. Dvuhklinovyĭ drovokoljnyĭ stanok. [**Twin-wedge wood cleaver.**] *Lesn. Prom.* 15 (6), 1955 (13–4). [Russ.]

Illustrated description of an electrically driven cleaver (type KC-6) capable of splitting billets up to 125 cm. long and 60 cm. diam. in halves or quarters. Daily output ca. 200 stacked cu.m.

1682. **Underwater tree cutter.** *Timb. Tr. J.* 219 (4184), 1956 (90).

A working model, developed by the U.S. Army, consists of a frame, at the above-water end of which is an electric motor. This drives a spiral cutter through universally-jointed shafts. Claws firmly grasping the trunk are pneumatically operated.

1683. HEYDEN, D. Leitern für den Forstbetrieb. **[Ladders for use in forestry.]** *Forstarchiv* 26 (5), 1955 (120). [G.]

Gives details of the price, weight and maximum length of 8 ladders and climbing devices of German and Swiss manufacture.

1684. **Machinery and equipment.** *World Crops* 8 (6), 1956 (246–7). O.R.E.

The Steel Squirrel, produced by the Blackwelder Mfg. Co., Rivista, Cal., is a telescopic tower with a pneumatically raised platform, mounted on a triangular, three-wheeled base equipped with a motor. Both the up-and-down movement of the platform, and the steering, starting and stopping of the base, can be completely controlled from the tower by pedals and levers giving perfect manoeuvrability. [Cf. *F.A.* 17 No. 2868.]

37. Transport

See also No. 2356.

372/377. Land Transport

See also Nos. 1651–4, 1668.

1685. STEINLIN, H. Probleme der Erschliessung ganzer Gebirgswaldkomplexe unter den Bedingungen nachhaltiger Nutzung. **[The opening-up of tracts of mountain forest under sustained working.]** *Allg. Forstztg.* 66 (21/22), 1955 (279–82). [G.]

Illustrates the technical, financial and managerial problems involved by a detailed analysis of the 2500 ha. of productive communal forests of Osnières (Valais). The relative merits of (1) leaving things as they are, (2) building a complete network of roads for (*a*) sledges, (*b*) horse transport, (*c*) 4-wheel-drive vehicles, or tractors, or (*d*) lorries, (3) installing large cableways (e.g. Wyssen), and (4) combinations of such systems, are discussed and a tentative programme combining (2) (*c*) and (3) is sketched. The need for more research into costs is stressed.

1686. WINKELMANN, H. G. Über die Hangerschliessung im Gebirgswald. **[Extraction from mountain slopes.]** *Allg. Forstztg.* 66 (21/22), 1955 (283–4). [G.]

Compares the annual costs for interest, amortization, upkeep and handling, chargeable to each cu.m. of wood brought down to the main roads by cableway or road, for sustained-yield cuttings, in 10-year periods and annual cuts of 1–5 cu.m./ha., and concludes that in most cases cableways will prove the more economical.

1687. KAUFMANN, G. v. Die Möglichkeiten der Holzbringung am Steilhang nach dem derzeitigen Stand der Entwicklung. **[Means of extraction on mountain slopes at the present stage of development.]** *Forstarchiv* 26 (5), 1955 (100–6). 11 refs. [G.g.]

Reviews methods of skidding (*a*) uphill using a motor winch, cableway, or sledges and (*b*) downhill, by gravity, using a hand-controlled rope, a motor winch, a skyline or sledges. Details of equipment required, daily performance, costs and suitability are given for each method.

1688. HANDEL-MAZZETTI, P. Holzbringung mittels Blechriese. **[Extraction of wood by a sheet-iron chute.]** *Allg. Forstztg.* 66 (21/22), 1955 (285–6). 1 ref. [G.]

Describes the construction, including costs of erection, of a portable chute for pulp- and fuelwood, made of 2-m. semi-tubular sheet-iron sections, and its operation, which, apart from initial difficulties with braking blocks, was efficient and cheap. The chute is cooled with water. [Cf. *F.A.* 15 No. 331.]

1689. LAMP, I. Riese und Loite. **[Simple and more permanent chutes.]** *Allg. Forstztg.* 66 (11/12), 1955 (139–42). [G.]

An illustrated account of the traditional Austrian methods of constructing simple chutes (*Loiten*) on the ground, or somewhat more elaborate ones (*Riesen*), more or less raised off the ground by sleepers, struts etc.

1690. FALTA, M. Smyky. **[Chutes.]** *Lesn. Práce* 34 (11), 1955 (516–9). [Cz.]

Illustrated description of the design and construction of chutes tested in Czechoslovakia; these are built from 8-m. poles of ca. 10 cm. diam., six poles being used to form a chute 50–60 cm. wide, which is attached to planking 1 m. wide, fixed to the ground. Satisfactory results are reported.

1691. **Defectoscope.** *For. Equipm. Note, FAO* No. *C.*15.56, 1956. pp. 2.

The Defectoscope (Integra Ltd., Zürich Industrial and Technical Co., Wallisellen, Switzerland) is an apparatus for detecting damage to internal wires in wire cables; its solenoid unit can detect a decrease of the wire-rope cross-section area down to < 2 sq. mm.

1692. Isachsens lunnetaubane. **[Isachsen's cableway skidder.]** *Inform. Skogbr. Skogind. Forskn-Foren.* (*Transportutv.*) No. 49, 1956. pp. 4 + separate English smry., pp. 1. [Nor.e.]

Describes, with illustrations, a skidder produced by Isachsens Mek. Verksted, Larvik, operated by a double-drum winch mounted on a tractor, and intended for short hauls.

1693. STEINLIN, H. Kostenvergleich beim Bergaufrücken im Gebirgswald. **[A comparison of costs for uphill yarding in mountain forest.]** *Forstarchiv* 26 (2), 1955 (48). 3 refs. [G.]

Gives costs in minutes of working time per load for each of 4 yarding methods on slopes of 60–100%. For loads of 0·4 to 0·75 cu.m. the cheapest method is with a one-drum winch of 7–9 h.p. A two-drum winch with haul-back line and skidding pan is advisable for difficult country; a tractor with winch is only recommended for moving heavier loads over shorter distances. Heavy installation costs prohibit the use of skylines except in rugged country or for large quantities of timber. The figures were compiled at the Swiss Forestry Research Institute, Zürich.

1694. DRESSLER, M., and ADÁMEK, I. Zkušenosti s malou lanovkou. **[Experience gained in working with a small cableway.]** *Lesn. Práce* 34 (11), 1955 (511–6). [Cz.]

Illustrated description of a Czech cableway (high-lead, up to 170 m. long, a 14-mm. skyline and 9-mm. operating cable, of lateral range 30–35 m., optimum load 1–1·5 cu.m., powered by 6- to 12-h.p. winches) successfully tested by the Research Institute for Forest Industry Mechanization near Brno.

1695. PAUL, H. Seilschraube und Seilgriffe. **[Cable screws and grips.]** *Forstarchiv* 26 (4), 1955 (96). [G.]

Illustrates a method of fastening the log with grips (double hooks linked by wires) during cable skidding, devised by the Hinterlangenbach school of forestry. These cable grips can take logs up to class 6 and are quicker to use than cable screws.

1696. BAUER, H. Der Flugkran in der Forstwirtschaft. **['Flying cranes' in forestry.]** *Allg. Forstztg.* 66 (5/6), 1955 (60–1). 2 refs. [G.]

A discussion of 2 types of helicopter (one, with a maximum load of 500 kg., for surveys, insect control etc.; the other, with a carrying capacity of 2500 kg., chiefly for extraction), their prices and estimated running expenses. At an estimated cost of DM.25/cu.m., extraction by helicopter in Central Europe could only be considered for extreme sites, but in view of its advantages for thinning operations etc. further research is advocated.

1697. SOLLI, S. Tømmerkjøring med hest. **[Timber transport using horses.]** *Tidsskr. Skogbr.* 64 (3), 1956 (149–76). [Nor.]

Includes information on the numbers of horses and tractors used in different counties of Norway; equipment and accessories for horse transport (with illustrations), general and by counties; size of crew; roads; breed of horse, type of collar etc.

1698. MAKKONEN, O. Puutavaran hevoskuljetus työntutkimus. **[Horse haulage of timber [in winter, using sledges]: a work study.]** *Julk., Metsäteho, Helsinki* No. 33, 1956. pp. 141 + [5]. 64 refs. [Fi.e.*e.*]

Investigations were made in the winters of 1947 and 1948 in S. and Central Finland respectively, on 28,815 cu. ft. of sawlogs and 88 cu.m. piled measure of cordwood. Results are given in tables and graphs, showing times taken for: collecting material for loading, hauling and carriage within a felling area, loading, and total time in the felling area; hauling; hauling at the storage site, unloading, and total time at the storage site. Summary tables show total time per cu. ft. or per cu.m. for sawlogs or for cordwood (pulpwood and fuelwood of different sizes).

1699. MANNER, E., and RONKANEN, A. J. Kakkula- vai saverikkovetoinen reki. **[Fixed shafts or fork shafts with grab hook for horse sledges.]** *Metsät. Aikak.* 1956 (9), (289–91). [Fi.e.]

Concludes from experiments and experience that shafts fixed on each side of the sledge are preferable to fork shafts with a grab hook in front. *From authors' summary.*

1700. BITTERLICH, E. 'Leerschlittenaufzug'. **[A 'lift' for unloaded sledges.]** *Allg. Forstztg.* 66 (3/4), 1955 (28–31). [G.g.]

Describes the use of a cable and winch to pull up empty transport sledges with their drivers over considerable distances and elevations, the lay-out of the simple track, winch requirements etc. Such simple semi-mechanization is considered preferable, under Austrian alpine conditions, to the use of tractors etc., as it continues to offer winter employment to a greater part of the labour force.

1701. Bil-tilhengere: I–IV. **[Trailers for lorries: I–IV.]** *Inform. Skogbr. Skogind. ForsknForen. (Transportutv.)* Nos. 45–48, 1955. Each pp. 3 or 4 (+ a combined English summary pp. 1.) [Nor.e.]

Describes and discusses the relative advantage and the use in Norway of semi-trailers, with and without independent load-bearing frame, and 2-shafted trailers, for timber transport.

1702. NEUBER, B. Aufprotzvorrichtung für den Einachsanhänger. **[Devices for hoisting one-axle trailers on to lorries.]** *Allg. Forstztg.* 66 (13/14), 1955 (170–1). [G.]

In a method developed in Austria, the lorry is slowly backed towards the trailer, which is braked against the ground by the pointed rear end of its shaft and so made to mount a ramp on to the specially adapted chassis; in a Swedish method, the trailer is pulled up along iron wheel-guides fitted to the rear end of the chassis at an angle, with the help of two chains fastened to the spokes of the rear wheels of the lorry and running over their rims.

1703. **1. Straussler 'Lypsoid' cross-country vehicle. 2. Wagner Logger Model LG 18.** *For. Equipm. Note FAO* No. *C.*12.56, 1956. pp. 2.

Descriptions with photographs and specifications.

1704. HAGLUND, L. Drivningar med OC3-or. **[Logging with OC3s [crawler tractors].]** *Skogen* 43 (19), 1956 (518 . . . 522). [Sw.]

Gives figures showing the use of horses and tractors for logging in 1954–55, and 1955–56 in Sorsele district, Västerbotten, and discusses modifications to the ordinary tractor model needed for this work, sledges for use in snow and on bare ground, and techniques for driving tractors in deep snow. For distances of ¼–1½ km., a unit area containing 3000–4500 cu.m. would be suitable for one OC3 for the winter season (120–160 working days); for distances of 2–4 km., a unit of 2300–3000 cu.m. Time studies on a number of skidding operations are discussed, giving particulars of distance, size of crew (including fellers), stand density, snow depth, volume extracted etc. An estimate of annual running costs of the tractor and costs per working hour are given. The advantages of the tractor over the horse are discussed.

1705. KANTOLA, M. Pyörätrakorin maastokelpoisuuden parantaminen lumessa liikuttaessa. **[Improving the mobility of wheel tractors on snow.]** *Metsät. Aikak.* 1956 (9), (274–81). 5 refs. [Fi.e.]

The Work Efficiency Association has carried out experiments aimed at enabling wheel tractors to move in snow away from specially built roads. At first both front wheels were replaced by special skis (Norwegian model), but later a ski was developed to go under the front wheels, allowing a rapid change

between wheels and skis. A device designed to broaden the bearing surface of the back wheels was soon abandoned as it failed to carry the tractor in deep snow. In other trials, both back wheels were equipped with specially constructed claws that penetrated the snow and gave the tractor the necessary grip for forward movement. Further experience will be gained during the winter. *From author's summary.*

1706. KALA, M. Přibližování dřeva Zetorem-25. **[Log transport by means of the tractor Zetor-25.]** *Lesn. Práce* 35 (1), 1956 (38–42). [Cz.]

Describes the operation of this wheeled tractor which was tested in 1955, the improvement of its longitudinal stability, and the fitting of a winch. Anti-slip chains were found to be very effective on marshy ground and on slopes.

1707. HEYDEN, D. Rückekarren. **[Barrows for cordwood.]** *Forstarchiv* 26 (3), 1955 (72). [G.]

Describes briefly, with illustrations, 6 barrows of German make, suitable for removing cordwood, two of which can be adapted to remove long logs.

1708. HANSEL, E. Kernhofer Verladegerät für Schichtholz, Stangen und Grubenholz. **[The Kernhof loading ramp for pulpwood, poles, and mining timber.]** *Allg. Forstztg.* 66 (21/22), 1955 (286–7). [G.]

Describes a loading-ramp trailer, 5 m. long, working on the conveyor-belt principle. A supplementary conveyor, 4 m. long, was used for extending the range and for loading floated wood straight from the water. The equipment, apart from its 3-h.p. Rotax petrol engine, was estate-built at Kernhof, Lower Austria. It loaded 1 cu.m. of pulpwood in ca. 2½ min., and 1 cu.m. of mining timber in < 4 min. under rather difficult conditions.

378. Water Transport

See also Nos. 1654, 1708.

1709. Martinsens veltelås. **[Martinsen's catch for bundling-chains.]** *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 54, 1956. pp. 2 (+ separate English smry., pp. 1). [Nor.e.]

Describes, with illustrations, a catch to secure the chains round the logs bundled for road transport to the floating channel. The catch is automatically released when a wire attached to it and to the top of the launching ramp is pulled taut as the bundle reaches the water.

1710. ZAĬCEV, N. T. Splav listvennogo lesa v pučkah. **[Floating hardwood logs in bundles.]** *Lesn. Prom.* 15 (6), 1955 (18–9). 1 ref. [Russ.]

Floating of hardwood logs in bundles, as developed by the Leningrad Academy of Forest Technology, has been in use since 1952. In order to make full use of this new method, the bundles should have a proper cross-section/diameter ratio, and the logs a roughly uniform length. The proportion of conifers added for buoyancy should not exceed the required minimum. To maintain stability, bundles of 25% coniferous content should have a cross-section/diameter ratio ⩾ 1·5; for small bundles (below 10 cu.m.) it should be markedly < 1·5; for bundles without coniferous wood, very near 1. A special tightening lever is illustrated and described for ensuring stable bundles of the desired diameter ratio.

1711. NYLINDER, P. Virkesfrågor vid flottning. **[Floating problems.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 2, 1956. pp. 12. [Sw.]

Discusses various aspects of research and includes data on: variation in moisture content; relation of dry and green density to position in stem for Spruce and Pine, and Pine respectively; theoretical calculations and actual figures for rate of drying (barked, partly barked, and unbarked logs), the progress of water uptake during floating, and green density of Pine and Spruce before and after floating, with and without bark. Other subjects of research are: the floatability of dried logs in different conditions; the effect on floating of being frozen in; the effect of the felling season; and the possibility of classifying logs for buoyancy, in the forest.

1712. NYLINDER, P. Studier över flytbarheten hos sommartorkad massaved. **[The floatability of pulpwood seasoned during the summer.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 1, 1955. pp. 21. [Sw.sw.e.]

Logs of Pine and Spruce, completely barked or barked in strips (ca. 500–600 of each category) were felled in spring, allowed to dry throughout the summer, launched in October, and kept in the floatway until the following October, being icebound for 6–6½ months. Density was measured at various times, and results are tabulated. If the practical limit for floatability is taken as 950 kg./cu.m. solid measure, floating loss after 1 year will be, by number of logs, 0·1% for both categories of Spruce, 1·7 and 1·8% for completely barked and strip-barked Pine respectively, and by volume 0·05, 1·1 and 1·2% respectively.

1713. JOHANSSON, F. Det sommartorra virkets flytbarhet vid förlängd flottning. **[The buoyancy of summer-dried wood during long floating.]** *Årsb. svenska Flottledsförb.* No. 29, 1955 (5335–9). [Sw.]

Spruce and Pine pulpwood (50,000 logs) was launched in a ring boom in autumn 1953, and a % of the logs weighed in Aug. and Oct. 1954. Taking 940 kg./cu.m. as the weight above which logs were liable to sink, and Sept. 1st as the mean date for sorting and bundling, it was calculated that sinkage % for completely barked logs would be 0 and 1·39 and for strip-barked logs 0·4 and 1·5% for Spruce and Pine respectively, calculated by number of logs, while the corresponding figures calculated by volume would be 0 and 0·81, and 0·08 and 0·75%. Stacked Pine logs were weighed at intervals during the unusually wet summer, with little sunshine, of 1954; completely barked logs dried satisfactorily, but strip-barked logs showed a moisture content of 50–60% at the butt end.

1714. NYLINDER, P. Undersökningar över lagringsskador hos flottat sågtimmer. **[Research on storage injury to floated sawtimber.]** *Uppsats. Instn.*

Virkeslära K. Skogshögsk., Stockh. No. 4, 1956. pp. 8 + 2 photos, 15 gphs., 16 tbls. [Sw.sw.]

Degrade is caused mainly by stain and rot developing during and after floating in splits occurring during storage, and by the splits themselves. Results of test sawings of 31,200 Spruce and Pine logs are given in graphs and tables showing % degrade for centre and side planks, for different sawing dates, storage conditions etc. Some examples of loss in value by degrade are: centre planks of Pine logs removed from the floating channel in June or September and sawn 2–3 weeks later, Kr.35–40 or Kr.80–90/std. respectively; centre planks of logs stored in bundles in the log pond from June or October until sawing in December, Kr.50 or Kr. 100/std. respectively; centre planks of Spruce logs sawn 2–3 weeks after removal from the floating channel in June or October Kr.15 or Kr.30, and of logs stored in the pond from June or October until November Kr.30 or Kr.50. Side planks lost considerably more in value than centre planks. Of logs stored in the pond, 80% of those in the unsubmerged part of the bundle were damaged. Damage in Pine logs stored in a single layer on the ice before floating was higher than in those from piles on the bank; the reverse was true of Spruce.

1715. PERTOVAARA, H. Koneellisesta erottelusta. **[Mechanical sorting of timber in floating.]** *Metsät. Aikak.* 1956 (5), (154 . . . 162). [Fi.e.]

Describes [with illustrations] Finnish, Swedish and Canadian sorting machines and discusses their technical details and merits. They have solved the problem at the sawmill, but mechanical sorting in floating is still experimental. *From author's summary.*

1716. KIVELÄ, A., and SAARELA, M. 'Valmet' virrankehitin. **[The 'Valmet' current-maker.]** *Metsät. Aikak.* 1956 (5), (163 . . . 169). [Fi.e.]

Describes in detail [with illustrations] the basic principles, different models and uses, of the 'Valmet', developed in Finland some years ago. It is considered of value in sorting floated goods as well as in log ponds etc. *From authors' summary.*

1717. **[Tugs and winch boats for floating.]** *Årsb. Finl. Flottarefören.* No. 24, 1955 (33–81). [Fi.e.]

Articles on: factors affecting the design of tugs for floating (*J. Pesonen*); steam or diesel engines in tugs (*O. Salminen*); types of motor-driven tugs and winch boats with a comparison of costs (*R. Eklund*).

1718. DARDEL, E. VON. Beskrivning av två nya typer av lätta transportabla varpbåtar. **[Description [with illustrations] of two new types of light portable winch boats.]** *Årsb. svenska FlottledsFörb.* No. 29, 1955 (5372–5). [Sw.]

38. Forest Engineering

1719. MASANI, N. J. **Notes on forest engineering.** English Book Depot, Dehra Dun, India. 1955. pp. v + 277 + iv. Price *Rs.*10.

Contains sections, in the form of notes arranged for use in practice, on: building materials (including quarrying), masonry, erection, carpentry and joinery, timber merchants, road-making, bridges, and water supply. Most of the factors discussed are of general application but the notes are designed for forest officers etc., working in Indian forests.

383. Roads and Bridges

See also Nos. 1651–4.

1720. HAFNER, F. Forstlicher Strassen- und Wegebau. **[The construction of forest roads and tracks.]** Verlag Georg Fromme & Co., Vienna. 1956. pp. 400. 290 refs. [G.g.] Price [$6·40].

Deals with general planning and lay-out, with special reference to forestry needs as to gradients, curves etc., and with constructions for different soil and topographical conditions, temporary and permanent surface treatment, special forestry skidways or sledge tracks, and the use of modern machinery, some of which is described and illustrated. Costs, including maintenance, are also considered.

1721. HAFNER, F., and HEDENIGG, W. Planiergeräte im forstlichen Strassen- und Wegebau. **[Mechanical earth-moving equipment in forest road construction.]** *SchrReihe forstl. VersAnst., Mariabrunn* No. 5, 1956. pp. 75. 9 refs. [G.]

Describes investigations during practical work in mountain country, on the performance and costs of various angle-dozers (Caterpillars D2, 4, 6 and 7 and Allis Chalmers H.D.9) and the Caterpillar motor grader No. 12, discussing the effect of soils, and rocks, vegetation, weather, altitude etc. Short-time (i.e. actual operating times) and long-period observations (including waiting times) showed performance rates considerably below those of American manuals, owing chiefly to difficult conditions, narrowness of roads built etc. Cost/performance ratios were much better for the medium and heavy models than for the lighter ones, but the latter can often be used on sites to which the heavy dozers could be got only at excessive cost or not at all.

1722. VETSCH, H. Neue Hilfsmittel für den Strassenunterhalt. **[New road-maintenance equipment.]** *Wald u. Holz* 38 (2), 1956 (32–3). [G.]

An illustrated description of the equipment supplied for attaching to the Unimog, consisting of a grader, a road 'plough' for levelling the hump in the middle of the road, a verge cutter, and a snow plough.

1723. **The 'Matbro Mantis'.** *Timb. Tr. J.* 219 (4181), 1956 (90).

Describes a mechanical handling unit made by H. & L. Mathew Ltd., of Wallington, Surrey, powered by a 40-h.p. Ford diesel and fitted with a 25-h.p. power take-off and a compressor. It can function through hydraulically operated attachments as a trench digger (outreach 17 ft. 1 in., maximum depth 12 ft.), earth loader (to 13 ft. 4 in.), dozer, side-slewing fork lift or mobile crane, platform lift (25 ft.) etc. The compressor with a pneumatic drill at the end of a boom makes otherwise inaccessible demolition work possible; it can also be used for spraying from the high platform. A winch can be fitted.

1724. LERAY, J. Les routes forestières de la Société Nationale du Cameroun. **[Forest roads of**

the Société Nationale du Cameroun.] *Bois For. Trop.* No. 50, 1956 (35–48). [F.e.span.]

Describes methods of road construction successfully used in the Cameroons.

384. Protective Works, including Torrent Training

1725. LESCANNE, G. Un aspect de la 'conservation des sols' en zone accidentée du nord Togo. **[An aspect of soil conservation in the broken country of North Togoland.]** *Rev. for. franç.* 8 (11), 1956 (747–53). [F.f.]

A short account, with costs, of torrent-training works begun in 1955.

385. Drainage, Irrigation, Sedimentation. Water Supply

1726. **Two types of well-drilling equipment.** *For. Equipm. Note, FAO* No. E.8.56, 1956. pp. 2.

Describes, with specifications, the Mangold heavy-duty water-boring machine (Mangolds Engineering Ltd., Port Elizabeth, S. Africa) and the Consol well driller (Consolidated Industries Inc., West Cheshire, Conn.).

4. FOREST INJURIES AND PROTECTION

See also Nos. 1354, 1357, 1619.

1727. FLËROV, S. K. [Editor]. Lesozaščita. **[Forest protection.]** Goslesbumizdat, Moscow and Leningrad. 2nd ed. (rev.) 1955. pp. 439 + 9 plates in colour. 3 pp. of refs. [Russ.] Price *Roubles* 13·70.

A textbook for forestry schools, with two major sections: (I) Injurious animals (insects, birds, mammals) and plants (chiefly fungi), with chief reference to damage to the living tree, but also including damage to converted wood (pp. 15–266), and (II) Methods, technique, and organization of forest protection work (pp. 269–369). There are many illustrations and indexes of scientific names and of Russian names and terms.

1728. **Forest protection in the U.S.S.R.: summary of a report made to the FAO European Forestry Commission.** *Unasylva* 10 (3), 1956 (130–2).

A general account of prevention and control, particularly by aerial spraying with DDT or BHC preparations, and of the use of poisons in the soil against cockchafer larvae.

41. General Technique of Forest Protection. Types of Injury

1729. Pflanzenschutzmittel-Verzeichnis. 1956. **[Catalogue of chemicals for plant protection. 1956.]** *Merkbl. biol. Bundesanst. Land- u. Forstw. Braunschw.* No. 1 (9th ed.) 1956. pp. 60. [G.] Price *DM*.0·90.

Lists (under uses), tested and approved, mainly German, fungicides, insecticides, game repellents, rodent repellents and poisons, preparations for preventing nutrient deficiency, weedkillers, growth regulators, wood preservatives, spray appliances etc. There are indexes showing the various preparations arranged under manufacturers and alphabetically, with wood preservatives separately. Research centres are also listed. Preparations suitable for forestry and suitable only for forestry are marked.

1730. DUMBLETON, L. J. **Digest of plant quarantine regulations. Supplement II.** *FAO Developm. Pap.* No. 23 (2nd suppl.), 1956. pp. 20.

Covers Samoa, Solomon Is., Fiji, Gilbert and Ellice Is., Nauru, Netherlands New Guinea, New Caledonia, New Hebrides, Niue Is., Norfolk Is., Tonga, Union Is., and U.S. trust territories in the Pacific Is.

42. Injuries from Inorganic Agencies other than Fire

1731. OHNESORGE, B.; RACK, K. Die wichtigsten forstpathologischen Arbeiten der Jahre 1943 bis 1954. I u. II Teil. **[The most important works on forest pathology, 1943–1954. Parts I and II.]** *Forstarchiv* 25 (11), 1954 (249–253); 26 (4), 1955 (73–85). 385 refs. [G.]

The first two parts of a critical review covering forest damage from abiotic factors (*B. Ohnesorge*) and damage from fungi (*K. Rack*).

1732. HOLMGREN, A. Expositionens betydelse för tallkulturens utveckling på stora hyggen å hög nivå i Norrland. **[The importance of aspect in the growth and development of Pine stands on large clear-felled areas at high altitudes in N. Sweden.]** *Norrlands SkogsvFörb. Tidskr.* 1956 (1), (1–110). 26 refs. [Sw.sw.g.]

Sample plots were laid out in selected areas, at altitudes of 400–550 m. or over, previously clear-felled and now grown with even-aged stands at least 7–8 years old. Nine such areas were studied and are described, data being given on soils, ground vegetation, number of plants, mean diameters and heights, top-shoot lengths, and numbers of dead and injured plants; also on rainfall, temperature, wind and snowfall. The generally favourable rainfall and humidity are largely offset by the exposure to wind. Mortality was found to be higher, and stand density consequently lower, on N. slopes where snow lies and on the unsheltered plateau areas. Damage to buds and shoots, often resulting in bush-like trees, occurs most frequently on exposed sites; at high altitudes it is usually caused by climatic factors, but when it is found at lower altitudes and in sheltered places, insects are responsible. Snow breakage appeared to increase with altitude. Snow blight was widespread on large exposed areas of clear felling and was particularly severe in areas where snow lies and on S-facing slopes. 'Drying' (browning of needles over the entire tree or on the lower part of the crown only) occurred mainly on the highest part of the sites, decreasing with altitude especially on N. slopes; there was no evidence of fungus attack and the condition is probably related to snow drifting and melting, and to subsequent freezing, coating the

needles with ice. Sites that had been burnt after clear felling had sparse vegetation especially on the plateau areas; the mean top-shoot length on unburnt sites was some 20% higher than on burnt areas. As Spruce is less subject than Pine to injury by climatic factors and snow blight at high altitudes, a greater use of Spruce for such sites is recommended.

421. Air Currents

See Nos. 1732, 1893.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 1288, 1794, 2251, 2321.

1733. SASAKI, N., and TANIGUCHI, M. **[Investigations on the frost damage of Todo Fir planting area in Tomakomai District and silvicultural methods against its damage.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (929–66). 5 refs. [Jap.jap.e.]

Detailed statistics are presented in 15 tables, of the damage done in a 116-ha. plantation established on a frost-susceptible site. Silvicultural control is not mentioned in the summary.

1734. MERKERT, H. H. Waldbauliche Erkenntnisse aus einer Frostnacht. **[Silvicultural lessons from a night frost.]** *Forst u. Jagd* 4 (3), 1954 (97–9). [G.]

Describes, with illustrations, the effect of 8–10° C. of frost on 20 May, 1953, on Pine plantations in Saxony. The temporary drooping of terminal shoots resulted in crooked growth in that year's and the previous year's shoots. Permanent injury to frost-damaged deciduous nursery stock, chiefly Oak and Poplars, was prevented by cutting back.

1735. MASELLI, V. Osservazioni sul comportamento delle piante legnose in Liguria al freddo eccezionale dell' inverno 1955–56. **[Notes on the reaction of woody plants in Liguria to the exceptional cold in the winter of 1955–6.]** *Monti e Boschi* 7 (9), 1956 (403–10). [It.f.e.]

Temperatures as low as — 7° C. were experienced in Feb. 1956. Olives, Citrus and other fruit trees suffered the most severe injury. The chief sufferers among forest species were Eucalypts, Spruce and Silver Fir—the damage to the conifers being in the form of frost-crack. Resistance varied greatly between individuals of the same species.

1736. THIRGOOD, J. V. **[Regeneration of coniferous mountain forests in Cyprus.]** *Rep. For. Dep. Cyprus 1955*, 1956 (57–9).

Some 200 plots have been laid out in *Pinus nigra*, *P. brutia* and *Cupressus sempervirens* to study the result of regeneration by natural seeding or direct sowing on plots with litter removed and with deep or shallow cultivation. Initial germination was fairly satisfactory but bird damage caused an early loss of 30–60% of seedlings. This was followed by sharp and heavy mortality in May to mid-June, a time of rapid change in conditions associated with the sudden rise in temperature at the beginning of summer, when between $\frac{1}{3}$ and $\frac{2}{3}$ of the surviving seedlings were lost. Mortality continued throughout the summer, the level rising with changes in climatic conditions, until by the end of October only enough natural seedlings remained to replace those that had survived from previous seasons only to be killed this year. Cultivation had no significant effect on survival, and artificial sowing was no better than natural seeding. Previously such losses have been attributed to high surface temperatures resulting in scorching at the root collar, but observations now suggest that death is more probably the result of transpiration stress. Seedlings died suddenly; they often remained green for some time, but were brittle and crumbled to the touch. Mortality, though increasing throughout the summer, did not progress steadily; after any temporary alleviation of climatic conditions, the number of deaths increased sharply. Possibly the improved conditions lift the seedlings from a state of dormancy, or near dormancy, and induce growth activity which lowers resistance when the seedlings are exposed once again to extreme conditions. Subsequent observations during winter have shown a further mortality of 10–20% of the seedlings surviving the summer.

1737. GRASSO, V. Danni da siccità su faggio in Alto Molise. **[Drought injury to Beech in the high Molise.]** *Ital. for. mont.* 11 (5), 1956 (205–6). [It.it.f.]

At the beginning of Sept. 1956 the leaves of Beeches growing either in pure stands or mixed with *Quercus cerris* were observed to have turned red or bronze, and twigs and branches showed incipient dieback. The Oak did not display these symptoms, which are ascribed to the exceptional heat of the summer and consequent drought.

1738. TRUE, R. P., and TRYON, E. H. **Oak stem cankers initiated in the drought year 1953.** *Phytopathology* 46 (11), 1956 (617–22). 7 refs.

The full version of the summary already noticed [see *F.A.* 18 No. 542].

423. Precipitations

See also No. 1732.

1739. LEROY, P. Dégats occasionnés par la glace dans les forêts de l'inspection de Haguenau. **[Damage caused by glazed ice in the forest district of Haguenau.]** *Rev. for. franç.* 8 (10), 1956 (647–57). [F.]

Gives a general description of the glaze storm of 26–27 Nov. 1952, the different types of injury, volume of broken timber, and effect of damage on the biological and financial future of the forest.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 1258, 1377, 1518, 1597–9.

1740. **Nutrient sprays on bark.** *Amer. Nurserym.* 104 (7), 1956 (56–7).

Research was undertaken by the U.S.D.A. on the effectiveness of bark sprays in providing minerals to trees growing on soil deficient in certain micronutrients.

N, P and Rb were painted in bands round the branches shortly before the growing season. Early in April substantial amounts of the nutrients were

found beneath the bark to some distance from the point of application. By the end of April the nutrients had been mostly transferred to the buds and terminal leaves. It is believed that Zn and Fe, which are difficult to supply through the soil, and which often cause 'burning' when applied as foliage sprays, can be introduced through the bark. In the dormant period, nutrient sprays are only absorbed through breaks in the bark.

1741. GOOR, C. P. VAN. Kaligebrek als oorzaak van gelepuntziekte van groveden (*Pinus sylvestris*) en Corsicaanse den (*Pinus nigra* var. *corsicana*). **[Potassium deficiency as a cause of yellow-tip disease in Scots and Corsican Pine.]** *Ned. Boschb.-Tijdschr.* 28 (2), 1956 (21–31). 9 refs. [Du.du.e.]

The critical levels of K for yellow-tip disease in current needles sampled at the tops of trees on normal sites (with a well-developed profile and without undue disturbance from fertilizers) were ca. 0·35% and 0·30% by weight of dry matter for Scots and Corsican Pines respectively. On inland sand dunes rich in P and poor in other nutrients, the critical levels were higher, 0·46–0·63% for Corsican Pine. In green needles there was a close relationship between K contents in needles and in the soil; in yellow needles no direct relationship existed. The danger of yellow-tip disease appeared to be particularly high at a total K content in the soil of 0·01% and 0·006% K_2O soluble in 5% HCl for Scots and Corsican Pine respectively. Very low K contents are usually confined to the poorest soils, and the soil type should be a sufficient indicator without determination of the K content. A close direct relationship was found between K content of needles of Scots Pine and annual shoot growth. Tests showed that application of K_2SO_4 in the spring effectively reduced incidence of the disease, especially when basic slag was also added in the worst cases.

1742. KARSCHON, R. **Iron chlorosis of *Eucalyptus camaldulensis* Dehn. and its incidence in relation to soil conditions.** *Ilanoth* No. 3, 1956 (5–35). 51 refs. [E.heb.]

Describes the symptoms and associates them with the presence of > 4% active Ca in the soil, and slightly less Fe_2O_3 and distinctly more ash and CaO in the leaves of sick trees than in those of healthy neighbours. Considerable, but only temporary, greening was caused by soil applications of $FeSO_4$, but 3-year trees, not cut back, remained green for 31 weeks when chelated iron (Sequestrene NaFe) was applied. Waterlogging counteracts lime-induced Fe deficiency, and the amount of chlorosis is related to the salinity (mainly NaCl and Na_2SO_4) and the organic content of the soils containing active Ca. There is evidence of genetic variation in the propinquity of sick and healthy trees. Thus, not all calcareous soils induce lime-induced Fe deficiency, and healthy growth may occur on soils containing large amounts of active Ca if they also have a high content of organic matter and soluble salts. Fifteen similarly affected Eucalypts are listed. Lime-tolerant species are *E. cornuta*, *E. gomphocephala*, *E. hemiphloia*, *E. incrassata*, *E. leucoxylon*, *E. sideroxylon*, and *E. torquata*. [Cf. *F.A.* 15 No. 2602.]

1743. THIRGOOD, J. V. **[Treatment of the soil with a chelating agent to correct lime-induced chlorosis of *Eucalyptus rostrata*.]** *Rep. For. Dep. Cyprus 1955*, 1956 (63–4).

Treatment of the soil with the chelating agent Sequestrene NaFe has been found by R. Karschon [cf. preceding abstract] to correct lime-induced chlorosis of *E. rostrata*. In order to determine whether this condition in Cyprus also is the result of lime-induced Fe deficiency, certain chlorotic *E. rostrata* were stumped and treated with this chemical. The experiment is still in progress, but an initial leaf analysis showed a high concentration of Ca and a low one of Fe. Visual examination of the first coppice shoots showed no chlorotic symptoms on treated stumps, whereas untreated controls showed extreme chlorosis.

425. Chemical Influences (Atmospheric)

1744. ADAMS, D. F., SHAW, C. G., and YERKES, W. D., JR. **Relationship of injury indexes and fumigation fluoride levels.** *Phytopathology* 46 (11), 1956 (587–91). 10 refs.

Includes symptoms and injury indexes of *Pinus ponderosa* needles of 2 stages of growth, subjected to industrial-atmosphere levels of 12 and 1·2 parts HF/1000 million for 1–5 days. Index and exposure-factor relationship was significant at better than 1% fiducial level. [Cf. *F.A.* 13 No. 2225.]

1745. WALTER, H. J. **Variation in sensitivity to atmospheric fluorides among Ponderosa Pine seedlings.** *Abstr. in Phytopathology* 46 (11), 1956 (637).

In thousands of seedlings and trees 0·25 to 2·5 miles from the pollution source, 0–100% of needles and 0–86% of the total needle length of single plants were burned. Some plants were highly sensitive, others symptomless, while others fluctuated in reaction from year to year during 1951–54. Resistant and sensitive plants grew as close together as 2 in., and 2 years' experimentation has not related this anomaly to exposure, soil moisture, soil fertility or date of bud elongation.

1746. WENTZEL, K. F., and BRUNS, K. H. Waldvernichtung durch Haldenbrand. **[Destruction of forests through spoil-mound fires.]** *Forst- u. Holzw.* 11 (21), 1956 (460–3). 7 refs. [G.]

Describes and illustrates the disastrous effects of the fumes from a subterranean spoil-mound fire, in the Ruhr district, on a forest to the N.E. of it (i.e. downwind from the prevailing wind), of which the greater part has been killed. Species affected, in ascending order of resistance, are: Pine, Hornbeam, Birch, Oak and Alder, with shrubs and ground vegetation showing least signs of injury.

43. Forest Fires

1747. **Glossary of terms used in forest fire control.** *Agric. Handb. U.S. Dep. Agric.* No. 104, 1956. pp. 24.

1748. **Fire protection.** *Rep. For. Dep. Brit. Hond. 1955*, 1956 (6–8).

Gives an account of the disastrous fire season of 1955, causes and behaviour of fires, effects on regeneration, and obstacles to control. Recommendations are made for improving firebreaks and communications, and reducing hazard, especially by prescribed burning.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

1749. INOUE, K. **[A study of forest fire prevention.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (162–6). 2 refs. [Jap.e.]

The author's $CoCl_2$ moisture-indicator paper [see *F.A.* 14 No. 2353] was calibrated in the laboratory for temperatures from 5 to 35° C. and relative humidity (r.h.) up to 100%. The values determined for hue, luminosity and saturation are shown for a representative spread of points along lines of constant temperatures (5° intervals) and rising r.h. (10% intervals). A colour chart is given of 6 tints graded from rose through lilac to blue, with the different values of these 3 colour attributes against them. Thus the change to cobalt blue occurs when the temperature is 5–10° C. and the r.h. is $< 50\%$, but with higher temperatures (and increasing fire risk) this change takes place at higher humidities, thereby providing the necessary warning.

1750. COUNTRYMAN, C. M. **Old-growth conversion also converts fireclimate.** *Fire Control Notes* 17 (4), 1956 (15–9). 5 refs.

Discusses the alteration caused by partial cutting in air temperature, relative humidity, wind velocity etc. within the stand, which may greatly increase fire hazard irrespective of the amount and kind of fuel.

1751. HILF, H. H. Selbsttätige Feuersicherung in Kiefernrevieren. **[Automatic fire prevention in Pine districts.]** *Forstarchiv* 26 (5), 1956 (106–7). [G.]

To restrict fire-spread during the war in Pine stands at Finowtal near Eberswalde, intersecting ploughed lines were laid out in a 50 × 100 m. grid, the ground being opened up to a width of 60 cm. and the adjacent surface strewn with sand, making a firebreak 1 m. wide. This method proved effective against incendiary bombs. As a precaution against fire spreading to thicket stands from dry grass under mature Pine, during the period of dry E. winds in spring, felling should begin from the W. and the regeneration area should be completely cultivated.

1752. SHEPHERD, W. O., *et al.* **Pasture firebreaks: construction and species trials on Pond Pine sites in N. Carolina.** *Bull. N.C. agric. Exp. Sta.* No. 398, 1956. pp. 33. 16 refs.

Six firebreaks were established in 1948–49 on two flat, poorly drained sites. These were ¼-mile long, 200 ft. apart and ca. 18 ft. wide, except one which was 36 ft. wide. Three were mechanically side-ditched and cambered for local drainage, the others were not. Construction methods and equipment are described. Four grasses and 4 legumes, pure and in mixture, were sown in separate plots on the firebreaks, after liming and fertilizing, and their flammability tested. Results showed that ditching and cambering are essential on poorly drained sites and that the least inflammable species were *Trifolium repens* Ladino, *Lotus uliginosus*, *Festuca arundinacea* and *Dactylis glomerata*. Although pure legumes were more fire-resistant, grass/legume mixtures produced more forage and resisted weed invasion better.

432. Prevention and Control

See also No. 2020.

1753. **Development and test of USDA forest service Model FS-5 smokejumper parachute.** *E.D. Rep. U.S. For. Serv* No. 40, 1956. pp. 20.

1754. **Pocket bands improve opening performance of personnel parachutes.** *E.D. Rep. U.S. For. Serv.* No. 41, 1956. pp. 12.

1755. **Fire-fighting installation.** *For. Equipm. Note, FAO* No. E.10.56, 1956. pp. 2.

Describes the Watson-Hypro pump (H. S. Watson Co., Emeryville 8, Calif.) which gives pressures of > 350 lb. and a capacity up to 14 gal./min. It is driven by take-off from lorry engine.

1756. MILLER, G. **Ice hydrant provides emergency winter water supply for fire fighters.** *Fire Control Notes* 17 (4), 1956 (20–2).

Describes, with plans, a device using a 55-gal. drum of diesel oil (both ends removed) for keeping a water hole open in the thick ice of a lake or stream. The oil pressure above the upper ice surface reduces the degree of freezing below the oil level. Suction hose attached to the mobile fire pump passes through the column of oil to the water below.

435. Benefits of Fire Control. Injurious Effects of Fire

See Nos. 1250, 1456, 2362.

1757. VIGNAL, P. La disparition de la forêt malgache des hauts plateaux. **[The disappearance of the high plateau forest of Madagascar.]** *Bois For. Trop.* No. 49, 1956 (3–8). [F.e.span.]

Describes the destruction of 1500 ha. of primary forest within a few days by an almost invisible 'humus fire' that crept along at a depth of 5–10 cm. beneath the surface. This type of fire may explain the disappearance of a large part of the high plateau forest in areas where human interference is unlikely.

1758. BURNS, P. Y. **Fire scars and decay in Missouri Oaks.** *Bull. Mo. agric. Exp. Sta.* No. 642, 1955. pp. 8. 5 refs.

A study was made of *Quercus coccinea*, *Q. velutina* and *Q. alba* in stands that had been cut and burned over frequently. Fire scars were associated with more than half the cull due to decay. Decay after wounding spreads upwards at a rate of 1–2 in./year. Wounds on *Q. coccinea* and *Q. velutina* take ca. 6 years to heal compared with 17 years for *Q. alba*.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

1759. FALKENBERG, H. Forstunkräuter. **[Forest weeds.]** A. Ziemsen Verlag, Wittenberg/Lutherstadt. 1956. pp. 83. 18 refs. [G.g.] Price *DM*.3·75.

Gives a short description, with illustrations, of the more important German herbaceous and grassy weeds, and also of dwarf shrubs, brambles and the ferns of the forest floor and clear fellings, their value as site indicators, the harm they do, and measures of prevention and control.

1760. SAMPSON, A. W., and SCHULTZ, A. M. **Control of brush and undesirable trees. II.** *Unasylva* 10 (3), 1956 (117–29).

In continuation of the article noticed in *F.A.* 17 No. 4070, describes and illustrates chiefly heavy equipment, such as tree-dozers, root cutters, brush-piling devices, stumpers, or brushland ploughs, and also power saws, tractor-mounted or hand-operated, and other hand-operated tools.

Weeds: Chemical Control

See also Nos. 1528–31, 1610–2, 1647, 1729.

1761. TSCHIRLEY, F. H. **Woody plant control in the Western States.** *Proceedings 8th Calif. Weed Conf. & 15th West Weed Control Conf.* 1956 (49–52). From *abstr.* in *Weed Abstr.* 5, 1956 (No. 1380). O.R.E.

Control of *Tamarix pentandra*, *Flourensia cernua*, *Arctostaphylos pungens*, *Quercus douglasii*, *Prosopis iuliflora* and *Artemisia tridentata*.

1762. JERMANOVÁ, H. K hubení buřeně chemickými prostředky. **[Weed killing with chemical agents.]** *Lesn. Práce* 34 (9), 1955 (391–7). [Cz.]

Describes the results of field experiments with $KClO_3$ in the Krivoklatsko region in [autumn?] 1952. It was used either in 1·5–3% solution (50 or 100 g./sq. m.) or as dust (60–100 g./sq. m.), the application being repeated after 1 month. *Calamagrostis epigeios* was largely destroyed and replaced by other species. Two-year Oak died when transplanted to the treated soil within 2½ months after treatment; 2-year Pine and Lime transplanted in spring 1953 did not die.

1763. LACROIX, J. D., and GUARD, A. T. **Morphological and histological modifications of Pine seedlings induced by petroleum naphtha.** *Canad. J. Bot.* 34 (3), 1956 (621–7 + 2 photos). 22 refs. O.R.S.

Pinus caribaea, *P. sylvestris* and *P. resinosa* seedlings at various stages of growth were subjected to pre- and post-emergence sprayings with the undiluted contact herbicide Standard Weed Killer (a Stoddard solvent naphtha), at dosages from 50 to 1000 gal./acre. After 10 days the cotyledons and hypocotyl in young seedlings had darkened and wilted, and older foliage was yellow and burned. Plasmolysis and cytolysis of the cortex, pith, and mesophyll, and stomatal closure also took place. Slash Pine seedlings possessing seed coats proved considerably more susceptible to the spray than similar Scots Pine and Red Pine seedlings—at 600 gal./acre, mortality of Slash Pine seedlings was 91·7%, compared with Scots Pine 17·6% and Red Pine 4·2%. A pre-emergence treatment at 200 gal./acre reduced germination of Slash Pine by 20%.

1764. LINT, H. VAN. **[Chemical weed control.]** *Jaarb. Proefsta. Boomkwek. Boskoop* 1955 (109–14). [Du.]

In experiments on sandy soils, using a mixture of 0·5% DNC and 0·7% IPC at 1000 litres/ha., avenue trees, deciduous shrubs sprayed between autumn and the spring flushing, *Taxus*, and green forms of *Chamaecyparis* and *Thuja occidentalis* were all undamaged; *C. pisifera* var. *plumosa aurea* was discoloured and damaged. Young weeds were controlled, older weeds and grasses only partially so. In seedbed experiments Shale W did little or no damage to seedlings of *Pinus* spp. and at 750 and 1000 litres/ha. gave good control of *Poa annua* and *Gnaphalium uliginosum* but not of *Senecio vulgaris*. Pre-emergence spraying of *Pseudotsuga taxifolia* with Shell PE 30 [an oil containing PCP] + CIPC at the rates of 30 + 5 litres/ha. respectively, almost completely controlled weed growth; none of the chemicals tested caused damage to the seedlings.

1765. ANDERSEN, H. E. **The problem of brush control on cutover areas in southeast Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 33, 1956. pp. 2. 1 ref.

Using 54 lb. crystals/acre of NH_4 sulphamate caused defoliation of nearly all brush. Many Hemlock seedlings died but Sitka Spruce proved more resistant. As costs were high and there was much resprouting, other methods of control should be tried.

1766. WALKER, L. C. **Studies of chlorobenzoic acid—a progress report.** *Proc. 9th ann. Sth. Weed Conf.* 1956 (134–41). 11 refs. O.R.E.

A report on early research with chlorobenzoic acid formulations for woody plant control. Reaction to frill-girdling treatments appears to be faster than with standard 2,4,5-T applications. Oaks are particularly susceptible. Hickories shed their bark below the frill. Good kills of Honeysuckle took place. Pines were not killed. Translocation of at least one of the compounds through the plant seems sporadic. Many tests show that the materials act like contact killers. *Author's summary.*

1767. HÄGGSTRÖM, B. Norrlands Skogsvårdsförbunds kommitté för hormonderivatfrågor. **[The Norrland Skogsvårdsförbunds committee on growth regulators.]** *Norrlands SkogsvFörb. Tidskr.* 1956 (1), (116–21). [Sw.]

Reports briefly on the committee's activities in 1954–55, and includes graphs showing the increasing effect of Hormoslyr 64 [a 2,4,D + 2,4,5-T preparation] applied from the air, with increasing temperature and dosage, and decreasing effect with later date of application from June to August, and a table showing recommended dosages for aerial spraying of Birch for different altitudes and latitudes and dates of spraying.

1768. BÄRRING, U. Intryck från studier av lövvegetationens behandling med kemiska preparat i Norrland. **[Treatment of deciduous species with**

chemicals in Norrland.] *Norrlands SkogsvFörb. Tidskr.* 1956 (2), (203–37). 11 refs. [Sw.sw.]

Areas in mature stands and in regeneration (mainly Pine) sprayed from the air in 1951–55, mainly with 2,4-D/2,4,5-T ester-type preparations, were studied. Sprayings before 1955 were very uneven in their effect on Birch and Aspen. In 1955, improved spraying techniques and higher concentrations were used, and weather conditions were more carefully studied; results were promising, but it is too soon to say whether sprouting has been controlled. There was heavy damage to young Pine sprayed in early July, but damage decreased with lateness of spraying in the period late July to early August; the strongest plants were most heavily damaged. The small amount of Spruce present seemed more resistant. Results of spraying from the ground and of poison girdling, the merits of growth regulators, and problems needing further study, are briefly discussed.

1769. BÄRRING, U. Om flygbesprutning i barrträdsföryngringar. [**Aerial spraying in conifer regeneration.**] *Skogen* 44 (1), 1957 (12–4). [Sw.]

Damage already reported [see preceding abstract] as visible in young Pine in the autumn after spraying with growth regulators in late July to early August 1955, proved by 1956 to be more serious than had been thought. Many leaders and other shoots were killed, and forking and bushy tops developed; varying numbers of young needles were also killed. Spruce remained less affected. Some sprayed areas were severely attacked by snow blight [*Phacidium infestans*], which intensified the direct spraying damage. Data are given for some areas on the number of seedlings in different classes (ranging from 0—undamaged, to 5—dead), mean height of the best plants (quality assessed before and after spraying), areas needing replanting etc. In view of the heavy damage, spraying should not be done before 10 Aug., but further research is needed. Control of hardwoods (mainly Birch) was satisfactory.

1770. MCCULLY, W. G., and DARROW, R. A. **Aerial and broadcast applications of granular Karmex in Oak woodlands.** *Proc. 9th ann. Sth. Weed Conf.* 1956 (118–20). O.R.E.

Granular Karmex proved a promising means of controlling Post and Blackjack Oak. Small plot tests indicated that the more soluble phenyldimethyl urea (Karmex FP) is more active than 3-(*p*-chlorophenyl)-1, 1-dimethyl urea (Karmex P). Desirable forage plants showed no visible signs of injury by Karmex P (10 lb./acre active ingredient). The pelleted herbicide must be applied when rainfall is enough to dissolve the granules and enable the material to be absorbed by the plant. One lb. Karmex contains ca. 117,000 particles. Uniform distribution of 4 lb./acre of pellets containing 25% active ingredient is equivalent to nearly 11 particles/sq. ft. Lateral movement of this size of particle during aerial application in an 8–12 m.p.h. cross-wind caused the granules to be deposited 84–126 ft. down-wind from the intended location. *From authors' summary.*

1771. ELWELL, H. M., ELDER, W. C., and LARSON, R. E. **Recent results on control of Oak with aerial applications of herbicides in Oklahoma.** *Proc. 9th ann. Sth. Weed Conf.* 1956 (113–7). 1 ref. O.R.E.

The sites treated were covered mainly with *Quercus stellata*, *Q. alba*, *Q. marilandica*, *Q. velutina* and *Q. prinoides*, but there were also other hardwoods. 2,4,5-T, 2,4,5-TP, 2,4-DP and an equal mixture of 2,4,5-T and 2,4-D were effective on the Oaks, when light to moderate rates of the acid of each were applied. The most consistently effective rate was 2–3 lb. acid/acre. Satisfactory results were obtained by applying 5 gal./acre of a spray solution consisting of the chemical mixed with sufficient diesel oil to make 1 gal. and emulsified in 4 gal. water. This spray, delivered through 5 nozzles to give a 33-ft. swath, gave good coverage of the foliage. Spraying was most effective during the period of active growth of the trees, i.e. just after the Oaks reached full leaf-size, but before elongation of the twigs had ceased.

1772. SILKER, T. H., and DARROW, R. A. **Aerial applications of 2,4,5-T and Silvex for hardwood control and increased forage production in scrub/hardwood/Pine stands in East Texas.** *Proc. 9th ann. Sth. Weed Conf.* 1956 (130–3). O.R.E.

The reaction of overstorey hardwoods ≥ 6 ft. high showed that 2,4,5-T and 2,4,5-TP (Silvex) have about equal value in defoliating and killing back scrub hardwoods in deep sands. 2,4,5-T was slightly more effective than Silvex on Hickory, Sandjack Oak and Red Gum; Silvex had a slight advantage in killing back Blackjack and Post Oaks. Successive yearly applications at low rates (e.g. $1\frac{1}{2}$ lb./acre followed by 1 lb./acre) proved more effective than a single higher-rate application. Although some damage to Pines took place, released Pines increased rapidly in vigour and re-established strong terminal shoots and normal needle growth in the year after treatment. Considerable increase in forage production occurred in the space of 2 years under treated stands that had been protected from grazing for the second year.

1773. MCCULLY, W. G. **Control of Post and Blackjack Oak by the soil injection method.** *Proc. 9th ann. Sth. Weed Conf.* 1956 (126–9). O.R.E.

Subsequent tests confirmed previous results [cf. *F.A.* 17 No. 3954]. High mortality can be obtained with oil solutions containing 4–8 lb. acid equivalent of 2,4,5-T per 100 gal. Aqueous applications of substituted ureas as low as 6 lb./100 gal. and of a 2,4-D/borate mixture at 7 lb./100 gal. (2,4-D basis) were also very effective. Treatments give good results if applied at the beginning of the build-up of soil moisture in early spring and continued until moisture is depleted, usually in early June. Increased volumes of the aqueous solutions were no more effective than the oil solutions. *From author's summary.*

1774. HANSEN, H. L. **Control of brush in forests, tree plantations and farm woodlands.** *Res. Rep. 12th ann. Nth. Cent. Weed Control Conf.* 1955 (166–8). From *abstr.* in *Weed Abstr.* 5, 1956 (1796). O.R.E.

A 4-year examination of the results of foliage spraying of *Ledum groenlandicum* with 2,4,5-T in oil indicates a high degree of recovery except where doses of 65 lb./acre were applied. Recovery was also marked on plots treated with 2,4-D/2,4,5-T. *Chamaedaphne calyculata* was more readily killed with 2,4-D at 5 lb./acre. Trials to determine the possibility of controlling swamp grasses, *Calamagrostis canadensis*, *Carex* spp., and *Scirpus cyperinus*, with dalapon (10 and 30 lb./acre), amino triazole (6 and 12 lb./acre) and Na polychlorobenzoates (2 and 8 lb./acre) showed that dalapon was the most promising herbicide for reducing grass with least damage to broadleaved species. All 3 chemicals proved injurious to Black Spruce. A comparison of various methods of applying undiluted 2,4-D and 2,4,5-T to cut surfaces of Red and White Oaks proved that the most effective treatment was 2,4-D (amine) applied in frill girdles at 0·5–2 ml./in. of tree diameter.

1775. ELWELL, H. M. **Control of brush on rangeland and pastures.** *Res. Rep. 12th ann. Nth. Cent. Weed Control Conf.* 1955 (160–2). From *abstr.* in *Weed Abstr.* 5, 1956 (1794). O.R.E.

Symphoricarpos occidentalis was successfully controlled by applying 2,4-D (isopropyl ester) at 1 lb./acre in water in May, annually for 4 successive years. The amine formulation at equal rates was considerably less effective, and a June application of either formulation proved less effective than May applications. Amino triazole at 2 lb./acre appeared to kill *S. occidentalis* when applied as a foliage spray, for no coppicing was recorded one year later. Amino triazole gave good control of *Xanthoxylum americanum* at 2 lb./100 gal. applied as a foliage spray. This species was found to be more susceptible to 2,4,5-T (ester) than to 2,4,5-TP (ester). Basal bark treatment of *Carya* spp. and *Quercus* spp. can be done satisfactorily with a trigger-type hand gun on stem diameters $\geq$ 6 in. The low-volatile ester formulation of 2,4,5-T in No. 2 diesel oil gave better control of both species than when formulated in a 50% emulsion of oil and water.

1776. MACRAE, J. W. **Weeds and brush in non-crop land. Roadsides and transmission line rights of way.** *Res. Rep. East. Sect. nat. Weed Comm. Can.* 1956 (34). From *abstr.* in *Weed Abstr.* 5, 1956 (1762). O.R.E.

A mixture of 2 lb. acid equivalent of 2,4-D and 2 lb. acid equivalent of 2,4,5-T (in 14 gal. of used transformer or grade-2 fuel oil) was the most effective treatment for brush control on rights-of-way. An average of 15 gal./acre was used for dense brush 2–3 ft. high and up to 30 gal./acre for brush 8–10 ft. high. Spraying was best done during the growing season, i.e. June to mid-September. Conifers can be killed with one treatment carefully applied; Maples generally require two or more spot treatments. From 1948 to date, some 15,400 acres have been sprayed successfully. The top growth of a large number of weed and brush species along a roadside was controlled with amino triazole at 48 lb./1000 gal. water applied at about 80 gal./acre.

1777. ROBERTSON, J. H., and CORDS, H. P. **Survival of Big Sagebrush of different ages after treatment with selective herbicides.** *Weeds* 4, 1956 (376–85). 13 refs. From *abstr.* in *Weed Abstr.* 5, 1956 (1610). O.R.E.

Two stands of *Artemisia tridentata* were sprayed respectively with 2,4-D (butoxyethanol ester) 2 lb. and 2,4,5-T (isopropyl ester) 1 lb., each mixed with diesel oil and shale oil, at 3 gal./acre. Unfortified shale oil was also sprayed at 50 gal./acre. Applications were made at 3 dates and to 3 age classes. Best control was obtained from the early applications. Suppressed juvenile plants and seedlings $<$ 4 in. tall under the mature stand (Class *B*), and shrubs 4–15 in. tall and $<$ 10 years old (Class *C*), were much more susceptible to 2,4-D at all dates than old mature shrubs (Class *A*). 2,4,5-T was more effective on Class *C* throughout the spring season than 2,4-D, but was less effective on Class *B*. Generally 2,4,5-T was more effective than 2,4-D at twice the dosage. Shale oil was no more effective than diesel oil as a carrier and was more disagreeable to handle; it was ineffective when used alone.

1778. HAY, J. R. **Translocation of herbicides in Marabu [*Dichrostachys nutans*]. I. Translocation of 2,4,5-trichlorophenoxyacetic acid following application to the bark or cut-surfaces of stumps. II. Translocation of 2,4-dichlorophenoxyacetic acid following foliage application.** *Weeds* 4, 1956 (218–26, 349–56). 25 refs. From *abstr.* in *Weed Abstr.* 5, 1956 (Nos. 1008, 1649). O.R.E.

442. Parasitic Higher Plants. Climbers and Epiphytes

See also No. 1272.

1779. HAWKSWORTH, F. G. **Upper altitudinal limits of Lodgepole Pine dwarf mistletoe in the central Rocky Mountains.** *Phytopathology* 46 (10), 1956 (561–2). 7 refs.

The upper limits for infested stands range from 9,200 to 10,700 ft., which is consistently 200–600 ft. below the upper limit of commercial Pine, thereby excluding sizeable areas from this pest. *Arceuthobium americanum* is probably limited by cold.

1780. WELLWOOD, R. W. **Some effects of dwarf mistletoe on Western Hemlock.** *For. Chron.* 32 (3), 1956 (282–96). 3 refs.

A study was made of 10 trees of *Tsuga heterophylla*, of which 4 were severely attacked by *Arceuthobium campylopodum* f. *tsugensis*, 3 moderately, and 3 lightly. Results are discussed in detail and the findings set out in graphs and tables. It is concluded that moderate infestation has no serious effect on the physiology of the tree. Severe infestation (large witches' brooms throughout the crown and stem swellings) had a serious effect on wood density: average sp. gr. of wood is lower than in uninfested trees, suggesting lower strength properties and a lower pulp yield. Severely infested trees were also found to have higher sp. gr. on the side nearest the infestation than on the opposite side, which might cause warping in lumber. Severe infestation also had a marked effect on the m.c. of wood, which was generally lower than that of uninfested trees.

443. Fungi and Bacteria

See also Nos. 1326–9, 1661, 1731, 2020.

1781. BAUDIN, P. Les maladies des plantes à parfum tropicales. **[Diseases of essential-oil plants of the tropics.]** *Rev. Mycol., Paris* 20, *Suppl. Colon.* No. 2, 1955 (73–112). 105 refs. [F.] I.M.I.

Includes descriptive notes and bibliographies of the diseases of *Eugenia aromatica*, *Eucalyptus globulus*, *Melaleuca* spp., *Cinnamomum* spp., *Santalum album*, *Canangium odoratum*, and *Illicium verum*. Rutaceae are excluded.

1782. BAKSHI, B. K., *et al.* **New and noteworthy diseases of trees in India. 9. Diseases due to *Polyporus tulipiferae*, *Hypoxylon ustulatum*, and *Polyporus rubidus*.** *Indian For.* 82 (9), 1956 (449–54 + 1 plate). 7 refs.

1783. DEIGHTON, F. C. **Diseases of cultivated and other economic plants in Sierra Leone.** Government Printing Department, Sierra Leone. Rev. ed. 1955 (1956). pp. 76. Price 5*s*.

Names 19 basidiomycete parasites (*Fomes*, *Ganoderma* etc.) on 20 tree hosts, and 3 ascomycete parasites (including *Nectria* dieback on *Chlorophora regia*) on 5 hosts, in the section on forest and shade trees. Minor leaf fungi include tar- and leaf-spots, black and brown moulds, and rusts.

1784. GREMMEN, J. **New and noteworthy discomycetous fungi on coniferous hosts from Switzerland.** *Sydowia, Annales Mycologici Ser. II, Horn* 9 (1/6), 1955 (432–6). 10 refs. [E.] L.S.

Describes and discusses *Dasyscypha fuscosanguinea* and *Durandiella helvetica* Gremmen sp. nov., both on *Pinus mugo*, and *Tryblidiopsis pinastri*, a saprophyte.

1785. BAZZIGHER, G. Pilzschäden an Kastanien nördlich der Alpen. **[Fungus damage to Chestnuts north of the Alps.]** *Schweiz. Z. Forstw.* 107 (11), 1956 (694–5). 4 refs. [G.]

Describes severe injuries caused by *Mycosphaerella maculiformis* and the secondary parasites *Coryneum perniciosum* and *Diplodina castaneae* in Switzerland N. of the Alps, for which frost damage in the winter and the wet summer have created favourable conditions.

Fungi and Bacteria: Chemical Control

See also Nos. 1533, 1535–6, 1729, 1814.

1786. NAPIER, E. J., TURNER, D. I., and RHODES, A. **The *in vitro* action of griseofulvin against pathogenic fungi of plants.** *Ann. Bot., Lond.* 20 (79), 1956 (461–6 + 1 plate). 7 refs. O.R.E.

In laboratory tests on 40 fungal pathogens, including *Armillaria mellea*, 4 types of morphological deformation as a response to various concentrations of griseofulvin are distinguished, *A. mellea* was in the second class of susceptibility, showing curled hyphae and excessive branching. The substance is considered of potential value against fungal diseases.

1787. CHARDENON, J., and TARIS, B. Effet phytotoxique de quelques fongicides vis-à-vis des boutures de peupliers. **[Toxic effects of some fungicides on Poplar cuttings.]** *C.R. Acad. Agric. France* 42 (14), 1956 (709–13). [F.] A.P.B.

After experiments *in vitro* to test the action of DNC and dinoseb and their derivatives on *Dothichiza populea* and *Cytospora chrysosperma*, further experiments were made to find whether these preparations are toxic to Poplar cuttings. With dinoseb at concentrations of ⩽ 5% all the cuttings survived, but roots were formed only 2 or 3 cm. from the base and some necrosis took place. With DNC at ca. 5% concentration nearly all the cuttings survived but slight basal necrosis occurred. Cu preparations had no toxic effect even at high concentrations.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 1533–7, 1732, 1802–3, 1813–4.

1788. **Leaf cast of Larch: *Meria laricis*.** *Leafl. For. Comm., Lond.* No. 21, 1955. pp. 4. Price 3*d*.

1789. PETRAK, F. Über *Phacidium infestans* Karst., einen gefährlichen Parasiten der Zirbelkiefer und einige andere in seiner Gesellschaft wachsende Pilze. **[*P. infestans*, a dangerous parasite of *Pinus cembra*, and some fungi associated with it.]** *Sydowia, Annales Mycologici Ser. II, Horn* 9 (1/6), 1955 (519–26). [G.] L.S.

The fungus was found on the needles of young trees in various parts of the Austrian Alps, on branches that had been completely covered by snow in winter, and it caused the death of many small trees. Other fungi mentioned are *Lophodermium pinicolum* and *Dothichiza pityophila*.

1790. BOOSALIS, M. G. **Effect of soil temperature and green-manure amendment of unsterilized soil on parasitism of *Rhizoctonia solani* by *Penicillium vermiculatum* and *Trichoderma* sp.** *Phytopathology* 46 (9), 1956 (473–8). 6 refs.

At 28° C. the % of *Rhizoctonia* hyphae parasitized by these two fungi was 18 for the amended and 8 for the unamended soil. At 18° C., no appreciable infection occurred. The *Penicillium* did not provide control of *Rhizoctonia* damping-off and seedling root-rot of peas in unsterilized soil.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 1615, 1758, 1782–3, 1873, 2251.

1791. PICHEL, R. J. Les pourridiés de l'*Hevea* dans la cuvette congolaise. **[Root rots of *Hevea* in the Congo basin.]** *Publ. Inst. nat. Étude agron. Congo belge* (*Sér. tech.*) No. 49, 1956. pp. 480. 335 refs. [F.f.] Price *Fr.*400.

Presents detailed biological and economic data, obtained during the last 6 years at Yangambi, in justification of the application on a plantation scale of the standard method of the Malayan Rubber Research Institute for the eradication of root rots in *Hevea*. The method consists in carefully exposing the root systems by digging out a basin of 25-cm.

radius and 15-cm. depth at the tap roots, in the 2-year plantation. This is gradually increased to 80 cm. and 20 cm. respectively in the 10th year. Every 4–6 months, the basins are maintained or extended and the length of any infected root is completely exposed, diseased portions excised or cut back and mycelium scraped off. Wounds are treated with 5% carbolineum solution and the whole length of lateral and tap root is washed with 2% $CuSO_4$. The root is then covered and not inspected for a year. The chief pathogens are *Fomes lignosus* and *Armillaria mellea*. More than 50% of the dead stems of the primary Yangambi forest are infected, all by root contact. After clearing, an important % of stools survive and form fresh foci. All wild tree species at Yangambi are susceptible. A period of 10 years under forest fallow reduces foci to negligible numbers, and girdling trees before felling would result in more thorough eradication. In heavy soils, root-rot mortality was about one-third that of the lightest soil. The incidence of *Fomes* and *Armillaria* rots varied with the soil, the former being predominant on those with more readily available water. Cover crops did not reduce rot attack nor, given the same regeneration, did burning after clearing. Information is also given on 8 other rots and their hosts, the parasitism of *Fomes* and *Armillaria* and their ecology, effects of disease on latex yield and other reactions in *Hevea*, and efficacy and economics of treatment.

1792. GARRETT, S. D. **Rhizomorph behaviour in *Armillaria mellea* (Vahl) Quél. I. Factors controlling rhizomorph initiation by *A. mellea* in pure culture. II. Logistics of infection.** *Ann. Bot.* 17 (65), 1953 (63–79 + 1 plate); 20 (78), 1956 (194–209). 19 refs. O.R.E.

When agar plates containing N (not in the form of nitrates, and preferably as peptone) and thiamin were inoculated with an isolate, rhizomorph initials began to develop after the 7th day. As their growth rate reached 5 times that of the mycelial hyphae, they soon overtook the mycelial margin developed earlier. An interrelation was found between carbohydrates and N and their effects on rhizomorph initiation and growth; as the concentration of the former increased, so did the optimum concentration for N. A certain minimum nutrient status of the substrate is necessary for rhizomorph initiation. Once they have started to grow, they inhibit the inception of further independent initials in their vicinity by the translocation into themselves of nutrients absorbed by the surrounding mycelium. When woody inocula prepared from shoots of *Salix alba* were buried in moist soil in a test tube, rhizomorphs grew out in all directions after a few weeks, whereas in quartz sand no outward growth occurred. Initial rate of growth depended on the size of the inoculum. A subsequent progressive decline in growth rate is attributed to (*a*) a gradual consumption of nutrient reserves in the inoculum, (*b*) increasing competition for nutrients between the main apex and subordinate branch apices, or from further rhizomorphs. Speed of infection, tested with potato tubers, increased with the size of the inoculum and decreased with its increasing distance, the interrelation between these factors being highly significant. When this 'inoculum potential' was low, advance of the fungus into the tuber was slowed down by host resistance. *From author's summary.*

1793. WOESTE, U. Anatomische Untersuchungen über die Infektionswege einiger Wurzelpilze. **[Anatomical studies on the paths of infection by some root fungi.]** *Phytopath. Z.* 26 (3), 1956 (225–72 + 4 plates). 53 refs. [G.g.] O.R.S.

Material from sound and infected roots of orchids, Oak and Spruce was inspected macro- and microscopically. The progress of entry into and development in the root is described in detail and illustrated by photomicrographs. Observations include the following: (1) *Rosellinia quercina* on Oak is unable to penetrate the thick cork layer except by single hyphae through e.g. lenticels or wounds; it spreads into the inner part of the root primarily through the rays, the cambial zone being heavily infected. Hyphal progress is preceded by browning of the neighbouring cells. The reproductive bodies originate in the lenticels. (2) *Fomes annosus* on Spruce can penetrate the cork cells easily, again by single hyphae, but infection spread rapidly in the neighbourhood of wounds and lenticels. Infection proceeds inwards through the rays but, in spite of the network of hyphae in the wood and cambium, only the heartwood shows evidence of decay. Fruit bodies appear in the lenticels, between the bark flakes and on suitable places on the root surface. (3) *Armillaria mellea* on Spruce is completely independent of wounds or lenticels, easily breaking through intact bark. Infection is by a mass of hyphal strands pushing into the tissue, neighbouring cells being destroyed by toxic action. Rays and resin canals serve as channels for infection inside the root, and the cambial zone and the inner bark are killed. The fruiting bodies are borne by the rhizomorph in the soil and coating the root surface.

1794. WRIGHT, E., and ISAAC, L. A. **Decay following logging injury to Western Hemlock, Sitka Spruce and true Firs [*Abies grandis* and *A. amabilis*].** *Tech. Bull. U.S. Dep. Agric.* No. 1148, 1956. pp. 34. 19 refs.

The entry and spread of decay following logging injury to residual trees in partially cut stands were studied on 13 areas in western Washington and Oregon. A total of 27 different fungi were identified. *Fomes annosus* root and butt rot was the most common rot on scarred *Tsuga heterophylla*, accounting for 63% of rots on that species along the coast and 26% inland; rots caused by *Stereum* spp. came next in order of frequency—7% on the coast and 26% inland. On the true Firs, *F. annosus* was responsible for 32% and *Stereum* spp. for 13%. On *Picea sitchensis*, on the other hand, *F. annosus* was found on only one tree, whereas *F. pinicola* caused 34%, *Stereum* spp. 15% and *Lentinus kauffmanii* 11% of infections. Decay occurred more frequently inland than on the coast, and injuries to the root and butt showed a greater incidence of decay than injuries occurring at or above 4·5 ft. Fewer than 50% of scars $\leqslant$ 1 sq. ft. in area had decay in them, whereas all scars $>$ 7 sq. ft. were infected. Decay

per scar was greater after a light than after a heavy cut, but a light cut (< 30% of bd. ft. volume) is much safer in respect of windthrow. Sunscald, previously almost unnoticed in this region, was prevalent in exposed Hemlock boles and almost every sunscald injury contained decay. Multiple regressions of area and age of scar, with and without decay, for scar sizes up to 10 sq. ft. and scar ages 3–30 years, were calculated for both Western Hemlock and Sitka Spruce. The trends were similar, but the rate of spread was slower for Spruce at the start and faster once decay was established.

1795. ETHERIDGE, D. E. **Decay in subalpine Spruce on the Rocky Mountain Forest Reserve in Alberta.** *Canad. J. Bot.* 34 (5), 1956 (805–16 + 3 plates). 10 refs. O.R.S.

A fuller account of work already noticed [see *F.A.* 15 No. 2629]. During 2 field seasons, a total of 465 living trees of *Picea glauca*, *P. mariana* and *P. engelmannii* were felled and examined on 12 sample plots of 0·1 or 0·2 acres. On the basis of plant indicators, plots were separated into dry and moist sites, and incidence of infection was determined for each. A comparison of the means of infected trees reveals that infection occurs twice as often on the moist as on the dry sites, and likelihood of infection tends to increase with age. On moist sites all trees of > 275 years had decay, compared with 325 years on dry sites. The sample data suggest that Spruce may grow to 100 years before infection occurs. A comparison of the fungi causing the damage showed that basal rots were responsible for 35·2% of the total cull, of which *Fomes pini* caused most damage, then *Stereum sanguinolentum* and *Peniophora septentrionalis*. Root and butt rots, which formed ca. 50% of the total number of infections, caused only 30% of the total volume of decay, the main fungi responsible being *Polyporus circinatus*, *Flammula connissans* and an unidentified fungus designated 'Unknown C'. The extent of decay caused by each fungus is shown in tabular form.

1796. NORDIN, V. J. **Red stain in Lodgepole Pine.** *Abstr.* in *Proceedings, 22nd Session Canadian Phytopathological Society, Edmonton 1955* No. 23, 1956 (18). I.M.I.

In 133 living 85-year-old trees in Alberta, 90% of all infections were firm red stain. Of 150 such infections *Stereum pini* was associated with 86%, *Fomes pini* with 7%, *Polyporus anceps* with 4%, and *S. sanguinolentum* with 3%. *S. pini* and *F. pini* entered the host chiefly through branch snags.

1797. TOOLE, E. R. **Hispidus canker.** *For. Fmr.* 16 (1), 1956 (7).

In the Delta Experimental Forest, Stoneville, Miss., 32 randomized plots were established in stands of *Quercus phellos* and *Q. nuttallii* averaging 66 trees/acre, with d.b.h. 6–24 in. Cankers of *Polyporus hispidus* were found on 13% of the former and 3% of the latter; 28% of the cankered *Q. phellos* had d.b.h. ⩾ 15 in. Loss in volume averaged 4% but on some plots reached 25%. Average length of heart rot was found to exceed the canker by 2½ ft., and cankers increased in length by ½ ft./year.

1798. SINADSKIĬ, JU. V., and BONDARCEVA, M. A. Maloizvestnye trutoviki na *Populus* i *Tamarix* i ih značenie v Kara-Kalpakskoĭ ASSR. **[Little known species of *Inonotus* on Poplars and Tamarisk, and their significance in the Kara-Kalpak ASSR.]** *Bot. Ž.* 41, (8), 1956 (1177–83). 3 refs. [Russ.]

A biological description of the wood-destroying fungi *Inonotus pseudohispidus* and *I. tamaricis*, which have caused serious damage in stands of *Populus ariana*, *P. pruinosa* and *Tamarix ramosissima*. A description with Latin diagnosis is given of *I. tamaricis* f. *corneus*. The nature of the injury caused is discussed and measures for control are mentioned.

1799. BAKSHI, B. K. **Further observations on mortality and unsoundness in Sal.** *Commonw. phytopath. News* 2 (4), 1956 (58–9).

Notes on injury to coppice-grown *Shorea robusta* in West Bengal by *Fomes caryophylli*.

1800. BAGCHEE, K. ***Merulius lacrimans* (Wulf.) Fr. in India.** *Sydowia, Annales Mycologici Ser. II, Horn* 8 (1/6), 1954 (80–5 + 3 plates). 8 refs. [E.] I.M.I.

Discusses recorded occurrences of the fungus in buildings and on felling sites in the Himalayan districts, particularly recent finds near Pulgu on Spruce and Fir (*Abies pindrow*), e.g. on charred logs. Sporophores and mycelia of this and associated fungi are described and illustrated, and questions of taxonomy discussed. The author believes there is only one species involved, which occurs as a native in the Himalayan forests and can spread to timbers.

1801. **Death of Pine trees.** *Rep. Dep. sci. industr. Res. N.Z. 1955/56*, 1956 (14).

Mortality of *Pinus radiata* trees in shelterbelts in New Zealand appears to be associated with the presence of *Phytophthora cinnamomi* in the soil of the root zone of affected trees. Soil samples from diseased and healthy rows of Pines and from adjacent open fields were examined. The % of infected samples rose from 0–10 in open fields to as much as 80 in the root zone of affected portions of shelterbelts. Root symptoms were confined to death of fine absorbing rootlets, but this would be sufficient to explain wilting and death of trees through reduced uptake of water and nutrients. In some shelterbelts where trees were not actually dying, unthriftiness (branch dieback, reduction in number and length of needles, and poor foliage colour) appeared to be associated with a high level of fungus in the soil.

1802. ROTH, L. F., TRIONE, E. J., and RUHMANN, W. H. ***Phytophthora* root rot of native *Chamaecyparis lawsoniana*.** *Abstr.* in *Phytopathology* 46 (11), 1956 (640).

For 18 years this rot has depleted nurseries and destroyed field plantings west of the Cascade Mountains. Before 1952 it was unknown in S.W. coastal Oregon. Its subsequent spread into the native forest, mainly along roads, stream banks, lakes and sloughs, is detailed.

1803. TRIONE, E. J., and ROTH, L. F. **Aerial infections of Port Orford Cedar [*Chamaecyparis***

***lawsoniana*] caused by *Phytophthora lateralis*.** *Abstr.* in *Phytophathology* 46 (11), 1956 (640).

The root-rot caused by *Phytophthora lateralis* was epiphytotic in S.W. Oregon by 1954. Foliage infections usually begin near branchlet tips, close to the soil, spreading widely in and up the tree. Sporangia and zoospores have been seen on the foliage, but before it changes colour, branch and stem cankers are difficult to detect. Infection occurs between 2 and 25° C., the sporangia forming at some intermediate temperature.

Wilts, Diebacks etc.

See also Nos. 1283, 1328, 1783.

1804. BECKMAN, C. H. **Production of pectinase, cellulases and growth substance by *Ceratostomella ulmi*.** *Phytopathology* 46 (11), 1956 (605–9). 20 refs.

Interest in these enzymes and auxins lies in their degradation of organic material by gummosis and tylosis, which enables facultative parasites e.g. certain wilts, to subsist as saprophytes. Pectin depolymerase and cellulases (C_1 and C_x types) were found, and diluted culture fluids were the equal of 5 p.p.m. I.A.A. in causing elongation of pea epicotyl.

1805. GRISWOLD, C. L. **Transmission of the Oak wilt fungus by *Pseudopityophthorus minutissimus* (Zimm.).** *J. econ. Ent.* 49 (4), 1956 (560–1). 3 refs.

Transmission of the wilt was obtained in the laboratory through beetle contact with a sporulating mat and subsequent feeding on a healthy Oak seedling. Field transmission is considered possible by the penetration of sporulating mats into beetle galleries and *vice versa* [cf. *F.A.* 15 No. 1523].

1806. GEORGESCU, C. C., and ORENSCHI, S. Contribuţii la studiul sistematic şi fiziologic al ciupercii *Verticillium albo-atrum* R. et B. [**The systematy and physiology of *V. albo-atrum*.**] *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 8 (1), 1956 (117–30). 2 refs. [Rum.rum.russ.f.*f.*] O.R.S.

Distinguishes two forms (f. *Cotinus* and f. *Acer*) isolated respectively from *Rhus cotinus* and *Acer tataricum*.

Cankers, Stem Rusts etc.

See also Nos. 1312–3, 1782, 1787, 1797.

1807. ***Tympanis* canker.** *Rep. N.Y. St. Conserv. Dep. 1955*, 1956 (80).

A canker caused by *Tympanis* sp. has been found in *Pinus resinosa* plantations throughout the state. Cankers are confined to the main stem of trees 20–30 years old. Open cankers lead to secondary infection with rot fungi. The disease is usually more prevalent on poor sites where stand vigour is low.

1808. HORNER, R. M. **A *Diaporthe* canker of *Betula lutea*.** *Abstr.* in *Proceedings, 22nd Session Canadian Phytopathological Society, Edmonton 1955* No. 23, 1956 (16–7). I.M.I.

The perfect state of a *Phomopsis* sp. found on dying tops of *B. lutea* in Ontario was identified and designated as *D. eres* f. sp. *betulae*. Observations and experiments showed it to be a facultative parasite which may kill foliage and young shoots and cause surface cankers on young branches without, however, girdling them completely. Under favourable conditions, infected seedlings or saplings recovered, but the fungus may be a serious pathogen for seedlings in their natural environment of low light and high humidity, and the cankers and wounds of dead shoots favour infections by secondary wood-rotting fungi.

1809. PROTO, S. Il cancro corteccia del castagno (*Endothia parasitica*) nei castagneti del Vulture. [***E. parasitica* in the Chestnut stands of Vulture.**] *Notiz. Malatt. Piante* No. 31/32 (*n.s.* 10/11), 1955 (189–91). [It.] I.M.I.

A note on the first occurrence of this disease in Lucania.

Foliage Diseases

See also Nos. 1314, 1483, 1783, 1788-9, 2225.

1810. MIELKE, J. L. **A needle cast of Lodgepole Pine caused by the fungus *Hypodermella concolor*.** *Res. Note Intermt. For. Range Exp. Sta.* No. 27, 1956. pp. 3. 3 refs.

Describes briefly the distribution, symptoms and life history of *H. concolor*, which causes heavy defoliation in *Pinus contorta* and *P. banksiana*. Areas most severely affected are usually cool valleys and river confluences where mists are common. No method of control has been found.

1811. VENKATARAMANI, K. S. **A leaf disease of nursery plants of the Silver Oak.** *Planters' Chronicle, Coonoor* 49 (21), 1954 (570–1). 4 refs. I.M.I.

Leaf-spot and defoliation of young *Grevillea robusta* plants is reported from S. India and may be prevalent over all the tea-growing area. The pathogen, *Amphichaeta grevilleae*, can defoliate and kill young plants; older plants may survive the attack but growth is retarded. Laboratory tests indicate that spraying the leaves with freshly prepared 1% Bordeaux mixture checks the fungus. Proprietary Cu-based fungicides are also effective when used at strength to give a Cu content equivalent to that contained in 1% Bordeaux mixture. A few sprayings at 10- to 15-day intervals during the rainy season should suffice. [Cf. *F.A.* 12 No. 2362.]

1812. CHIDDARWAR, P. P. **A new species of *Cercospora* on an economic host.** *Curr. Sci.* 25 (8), 1956 (267). A.P.B.

C. agharkari, causing leaf-spot of *Grevillea robusta* in Bombay State.

1813. **Oak mildew [*Microsphaera alphitoides*.]** *Leafl. For. Comm., Lond.* No. 38, 1956. pp. 6. Price 6*d*.

1814. RACK, K. Versuche zur Bekämpfung des Eichenmehltaus. [**Trials in the control of *Microsphaera alphitoides*.**] *Forst- u. Holzw.* 12 (1), 1957 (5–6). [G.]

When 4- to 5-year-old Pedunculate Oaks in trial plots of the Niedersächsische Forstliche Versuchsanstalt were experimentally sprayed in mid-August and early Sept., the three Cu preparations tried gave excellent control, better than the customary S sprays. Two caused slight burns, but Bordeaux mixture

showed no ill effects. Dithane (thiocarbamate) not only failed, but seemed to stimulate infection.

1815. GREMMEN, J. Een blad- en twijgziekte van populieren veroorzaakt door *Venturia tremulae* en *Venturia populina*. **[Leaf and twig disease of Poplars caused by *V. tremulae* and *V. populina*.]** *Tijdschr. PlZiekt.* 62 (5), 1956 (236–42 + 2 photos). 9 refs. [Du.e.] E.M.B.

The two species, their development in culture and the symptoms of the disease are described. *V. populina* has not yet been found in the Netherlands. Laboratory tests of *V. tremulae* are unlikely to be responsible for new infections in spring; mycelium survived the winter in twigs killed the previous year and produced conidia early in May. Control by removing dead twigs might be possible. Tests on hybrid Poplars at Wageningen showed considerable variations in their resistance.

Other Diseases caused by Fungi or Bacteria

1816. **Watermark disease of the Cricket Bat Willow.** *Leafl. For. Comm., Lond.* No. 20, 1956. pp. 5. 10 refs.

Notes on symptoms, spread, and control of the disease.

45. Damage by Animals

451. Mammals

See also Nos. 1270, 1562, 1661, 1729, 1843.

1817. READ, R. A. **Effect of livestock concentration on surface-soil porosity within shelterbelts.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 22, 1956. pp. 4.

In three shelterbelts in E. Dakota, 4 soil samples were examined from the top 3 in. of parts that had been (*a*) heavily used by, and (*b*) completely protected from, live-stock. Results, tabulated for bulk density, total pore space, and large-pore space, show that surface soils of (*a*) are consistently more compact than those of (*b*).

1818. RINEY, T. **Comparison of occurrence of introduced animals with critical conservation areas to determine priorities for control.** *Tech. Pap. N.Z. For. Serv.* No. 10, 1956. pp. 18. 7 refs.

Areas listed as critical from the conservation aspect by several government departments are described and mapped for comparison with the distribution and density of two introduced mammals, the red deer (*Cervus elaphus*) and brush-tailed possum (*Trichosurus vulpecula*). It is shown that, although government-financed control efforts have been mainly directed at areas containing the highest densities of these animals, this does not necessarily result in maximum relief to problems of conservation. This comparison demonstrates the need clearly to define cause-effect relations (problems) between introduced animals and areas regarded as critical. Priorities for control efforts should be based on the degree to which an area is critical to the conservation interests of New Zealand rather than on its ability to sustain high densities of animals. *Author's summary.*

1819. **Native animals damaging Victorian exotic plantations.** *Aust. Timb. J.* 22 (7), 1956 (711 . . . 714, 809).

Describes the signs of bark damage on Radiata Pine from *Trichosurus caninus* and *T. vulpecula*, *Wallabia bicolor*, and *Rattus assimilis*. [Cf. *F.A.* 14 No. 50.]

1820. UEDA, M., and KUWAHATA, T. **[Yearly fluctuation in size of the field mice populations in a private Larch afforestation in Hokkaido (Preliminary).]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (95–106). 22 refs. [Jap.jap.e.*e.*]

From 1946 to 1953 > 100,000 ha. were privately afforested and in the latter 3 years damage from mice affected 9000–15,000 ha. annually. This study reports the fluctuations in 2 one-hectare Larch plots of the populations of *Clethrionomys rufocanus bedfordiae*, *Apodemus ainuainu*, and *A. geisha-geisha*. [Cf. *F.A.* 16 No. 4274.]

1821. SHIBATA, Y. **[Studies on the mechanical control of field mice. (III). On the effects of control of field mice trenches on steep slopes in the afforested stands at Hidaka-Mitsuishi district.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (107–16). 5 refs. [Jap.jap.e.*e.*]

Summarizes results and points out that incessant rain and steep slopes of volcanic ash render the maintenance of trenches difficult here. This form of control for *Clethrionomys rufocanus bedfordiae* should be regarded as secondary to the cleaning of the undergrowth. [Cf. *F.A.* 16 (No. 4273).]

1822. WETTSTEIN, O. Ein katastrophales Schadauftreten des Gartenschläfers auf dem Mieminger Plateau im Oberen Inntal. **[A severe outbreak of garden dormice on the Mieminger Plateau, Upper Inntal.]** *Anz. Schädlingsk.* 29 (10), 1956 (156–8). [G.]

Damage to Pine and some Larch by girdling, continuing from spring into Sept. 1955, was found to be due to *Eliomys quercinus*. Trapping was the only possible means of control The large number of insects found on girdled trees indicated the advisability of felling damaged stems as soon as possible. [Cf. *F.A.* 16 No. 3163.]

1823. CHARLES, W. N. **The effects of a vole plague in the Carron Valley, Stirlingshire.** *Scot. For.* 10 (4), 1956 (201–4). 4 refs.

Among the causes of this plague of *Microtus agrestis* may have been exclusion of sheep from the afforested areas, which produced ground conditions favourable to the voles. Effects of the voles on ground vegetation and attack in young trees are described. *Picea abies*, *P. sitchensis* and *Pinus sylvestris* were heavily attacked; *P. sitchensis* alone had the capacity of shooting again from below the damaged area. *Larix leptolepis* was less severely attacked, and *Pinus contorta* least of all the conifers. On the few areas of hardwoods, Beech was apparently preferred to Sycamore Maple and to Ash which was almost untouched. Methods of sampling vole populations are described.

1824. MEYL, A. H. Praktische Erfahrungen bei der Erdmausbekämpfung. **[Practical experiences in**

control of *Microtus agrestis*.] *Forst- u. Holzw.* 11 (19), 1956 (429). [G.]

Experiences indicate that the use of toxaphene as spray or dust on regeneration areas in early autumn has good results and is not harmful to deer and small game, on which it acts as a repellent. Painting of 4- to 5-year plantation trees with toxaphene for 50 cm. or more from the base was effective, and also acted as a rabbit repellent. Dosages are suggested.

1825. KÜTHE, K. Erfahrungen bei der Bekämpfung der Erdmaus (*Microtus agrestis* L.) in Oberhessen 1955. [**Control of *M. agrestis* in Oberhessen in 1955.**] *Anz. Schädlingsk.* 29 (10), 1956 (161–4). 2 refs. [G.g.]

In the winter of 1955–56, under the supervision of the North Naussau forest district, 224·5 ha. of natural regeneration and plantations were sprayed with toxaphene, using the methods recommended by Schindler [cf. *F.A.* 17 No. 2991]. It was found advisable to begin operations in the autumn, since damage may appear as early as the beginning of October. With a suitable spray apparatus, water may be reduced to 40–60 litres/ha., the dosage of toxaphene remaining 6 kg./ha. A margin 10 m. wide round the area should also be treated in order to prevent migration. Knapsack sprays proved the cheapest and most efficient apparatus. Cost was ca. DM.50/ha.

1826. TEVIS, L., JR. **Behavior of a population of forest-mice when subjected to poison.** *J. Mammal.* 37 (3), 1956 (358–70). 19 refs. O.R.S.

In trials on a 15-acre clear-felled area in the California Douglas-Fir region, Douglas seed treated with compound 1080, which has no smell and only a slight taste, was used as bait. The object of the method is to induce bait-shyness and thus to develop a population of non-seed-eating rodents. A sowing of untreated seed in September, when invasion by non-resident mice was low, proved very successful, only 4% of seed-spots being robbed, but sowings in December–February, when invasion rates were higher, raised the figure to 46%. The following recommendations are made: (1) poisoned seed should be present throughout the period when control is wanted; (2) it must be protected from rain; (3) poison must be strong enough to prevent heavy consumption but weak enough to keep rodents from distinguishing treated from plain bait; (4) sowings must be made when the rate of invasion is low and completed not later than 2 weeks after distribution of bait.

1827. DINGLE, R. W. **Pocket gophers as a cause of mortality in eastern Washington Pine plantations.** *J. For.* 54 (12), 1956 (832–5). 4 refs.

Young plantations of *Pinus ponderosa* from 1 to 10 years were reduced, sometimes by 40%, as a result of damage by *Thomomys* spp. Some plantations of *Pinus sylvestris* were also attacked. In 1954 4 one-acre plots and 4 half-acre control plots were established and planted in spring 1955. On the treated plots tunnel systems were baited with carrot poisoned with strychnine. Average seedling survival was 12% higher on the treated plots after one year than on the controls. As gophers are primarily meadow dwellers they are unlikely to be a problem after crown closure.

1828. IRVING, F. D., BEER, J. R., and HALL, O. F. **Sugar Maple injury by grey squirrels in a Minnesota woodlot.** *Minn. For. Note.* No. 54, 1956. pp. 2.

Data were collected on type, severity, and position of current and past damage on 21 one-fifth-acre plots in mixed Red Oak/Sugar Maple stands. About one-third of Sugar Maple trees bore visible evidence of squirrel damage.

1829. YLI-VAKKURI, P. Männyn kylvötaimistojen hirvivahingoista pohjanmaalla. [**Elk damage in seedling stands of Pine in Ostrobothnia.**] *Silva Fenn.* 88 (3), 1956. pp. 17. 4 refs. [Fi.sw.e.*sw.*]

Signs of Elk damage were observed in 20% of stands sampled (100 sample plots): in half of these, hardwood saplings only were damaged; in the other half, Pine seedlings also.

1830. PUZYR, H.; JUDMAYR, O. Eine neue Methode des Kulturschutzes gegen Wildverbiss. [**A new method of protecting plantations against deer browsing.**] *Allg. Forstztg.* 66 (21/22; 23/24), 1955 (203; 315). [G.]

Puzyr describes the use of branches (slash etc.) ca. 0·75–100 cm. high, stuck into the ground close to each plant and given a deer-repellent coating (thus avoiding the danger of phytotoxicity). Judmayr reports on the successful use of this method with 'Picetol F', a German repellent which he also applied thinly direct on terminal shoots of Larch. Another method described as quick and effective was coating or spraying plants in bundles before planting out, whereby 1000 plants could be treated with repellent in ca. 10 minutes.

1831. GEIL. Praktische Winke für die Schälschadenbekämpfung. [**Practical hints for the prevention of bark-scaling by deer.**] *Holz-Zbl.* 82 (135), 1956 (1636–7). [G.]

Describes a hinged metal ring with handles, used to hold together the branches of young conifers (10–20 years) so as to facilitate their being tied to the stem with wire as a protection against barking by deer, and the use of roller incisors for bark scarification. [Cf. *F.A.* 18 No. 608.]

452. Birds

See Nos. 1562–3, 1843.

453. Insects

See also Nos. 1661, 1999, 2020.

1832. THALENHORST, W. Waldschäden durch Insekten (mit Ausnahme der Käfer). III Teil. [**Forest damage by insects (with the exception of beetles). Part III.**] *Forstarchiv* 26 (7), 1955 (149–57). 189 refs. [G.]

A critical review of the most important German works published between 1943 and 1954, with reference to Apterygota, Thysanoptera, Rhynchota, Lepidoptera, Diptera and Hymenoptera.

1833. GLEN, R. [Editor]. **Entomology in Canada up to 1956. A review of developments and accomplishments.** *Canad. Ent.* 88 (7), 1956 (290–371). 244 refs. O.R.S.

Includes a section by *M. L. Prebble* reviewing the history of forest entomology in Canada from 1909 to the present day.

1834. BONGBERG, J. W. **A status report on conditions of forest insects in the United States, 1955.** *FAO Plant Prot. Bull.* 4 (11), 1956 (161–7).

Covers about 46, generally epidemic, species with notes on host, injury, mortality, location, acreages affected, predisposing causes and control.

1835. SCHREAD, J. C. **Thrips on Privet and other insects on ornamentals.** *Circ. Conn. agric. Exp. Sta.* No. 201, 1956. pp. 11. 3 refs.

Deals with *Dendrothrips ornatus* on Privet, *Neolecanium cornuparvum* on Magnolias, *Toumeyella liriodendri* on *Liriodendron tulipifera*, *Monarthropalpus buxi* and *Psylla buxi* on Box and *Tetraleurodes mori* on Kalmias.

1836. NEISWANDER, R. B. **Control of insect pests of ornamentals.** *Amer. Nurserym.* 104 (9), 1956 (11, 78–82).

Describes briefly *Chrysobothris femorata*, harmful to weak or transplanted Maple, Elm, Oak and Dogwood trees; *Cyllene robiniae*; the midges causing marginal-fold gall and vein-pocket gall on Willow and Red Oaks; *Neuroterus noxiosus*, which is responsible for galls on the Swamp White Oak; and eriophyid mites causing Maple bladder and Ash flower galls. Spraying of the trunk and large branches with 2 lb. DDT in 100 gal. water 3 times at 20-day intervals, is recommended.

1837. TRAIAN, I. Vătămarea conurilor de răşinoase în arboretele din Valea Sebeşului. **[Damage to cones of conifer stands in the Sebeş Valley.]** *Rev. Pădurilor* 71 (3), 1956 (170–1). 1 ref. [Rum.]

A total of 700 hectolitres of cones were collected from trees 70–100 years old, and a sample of 300 hl. analysed for damage. It was found that 18–47% of cones were attacked by *Laspeyresia strobilella*, 3–5% by *Dioryctria abietella*, and another 1–3% by *Eupithecia* sp. and *Kaltenbachia strobi*; and that 23–32% contained seed attacked by *Plemeliella abietina* and *Megastigmus strobilobius*. Other cones (1–2%) showed partial damage by woodpeckers, crossbills and squirrels. The total % of sound cones was 24–40.

1838. BAKKE, A. **Insects reared from Spruce cones in northern Norway, 1951: a general view with special stress on the parasitic hymenoptera of the subfamilies Chalcidoidae and Serphoidae.** *Norsk Entomologisk Tidsskrift, Oslo* 9 (3/4), 1955 (152–212). 70 refs. [E.e.] I.I.E.

Describes the breeding techniques and specially constructed rearing cages; also the 19 species reared from 61 samples of cones (each sample 2–6 litres) from different localities in Nordland and Trøndelag, and discusses their biology and distribution in Norway. *Laspeyresia strobilella*, perhaps the most serious cone-damaging insect, was reared from nearly all, and *Kaltenbachiella strobi* in great numbers from all samples. Large numbers of parasitic hymenoptera (14 species, many of them new to Norway), were also reared.

1839. RUMMUKAINEN, U. Käpytuhojen esiintymisestä metsikössä erään esimerkin valossa. **[On cone injuries in a Larch stand.]** *Annales Entomologici Fennici, Helsinki* 21 (1), 1955 (45–51). 7 refs. [Fi.e.e.] I.I.E.

In a stand of Siberian Larch in Punkaharju experimental area (S.E. Finland), planted in 1929 and examined in 1951, the % of sound cones increased from 23 on the S.E. side to 51 on the shady N.E. side. Damage by individual pests, mainly *Chortophila laricicola*, *Hylemyia anthracina*, and *Dioryctria abietella* followed the general trend.

1840. JAHN, I. Lärchenschädlinge im natürlichen und künstlichen Verbreitungsgebiet der Lärche (mit besonderer Berücksichtigung der Lärchenschädlinge Österreichs). **[Pests of Larch inside and outside its natural range (particularly in Austria).]** *Öst. Vjschr. Forstw.* 97 (1), 1956 (27–36). 9 refs. [G.g.]

1841. OSSOWSKI, L. L. J. **Notes on insects observed [damaging Wattles] during the period 1955–1956.** *Rep. Wattle Res. Inst. S. Afr. 1955/56*, 1956 (37–41 + 10 photos). 3 refs.

Some insects, notably bagworms, a lasiocampid, and some chafers, increased, and 8 insects not hitherto recorded as Wattle pests did considerable damage over large areas. Where there was high rainfall jassids, capsids, and Citrus thrips decreased. The % mortality from 7 causes is analysed for 85,574 bagworms. [Cf. *F.A.* 17 No. 1770.]

1842. WOLCOTT, G. N. **The insects of 'almendron', *Prunus occidentalis* SW.** *Carib. For.* 16 (3/4), 1955 (98).

Investigators of trees in the Toro Negro Unit found numbers of *Compsus maricao*, *Diaprepes abbreviatus*, *Pseudaulacaspis pentagona* and two aphid species.

1843. GÄBLER, H. Tiere an Pappel. **[Poplar fauna.]** A. Ziemsen Verlag, Wittenberg. 1955. pp. 42. 20 refs. [G.]

A popular illustrated account, dealing mainly with insects, but with short sections also on spiders, birds and mammals.

Insects: Natural and Biological Control

See also Nos. 1838, 1853, 1855, 1858–9, 1868, 1881–2, 1885, 1887–9, 1891–2, 1909–10, 1913, 1918, 1920–2.

1844. CLAUSEN, C. P. **Biological control of insect pests in the continental United States.** *Tech. Bull. U.S. Dep. Agric.* No. 1139, 1956. pp. 151. 152 refs.

Contains (1) a general section on biological control, including effects of insecticides, methods of mass culture of predators and parasites etc.; (2) results of biological control on individual pests arranged under the heads: fruit insects; field and garden insects; insects affecting forest, shade, and

ornamental trees and shrubs; miscellaneous insects; (3) notes on established parasites and predators arranged alphabetically. There is a combined index of all genera and species mentioned.

1845. WELLENSTEIN, G. Die Insektenjagd der roten Waldameise (*Formica rufa* L.). **[Predation on insects by *F. rufa*.]** *Z. angew. Ent.* 36 (2), 1954 (185–217). 69 refs. [G.]

1846. BETTS, M. M. **A list of species taken by titmice in the Forest of Dean (Gloucestershire).** *Ent. mon. Mag.* 92 (1102), 1956 (68–71). 2 refs.

A comprehensive list of insects found in the gizzards (collected monthly 1948–51) of the 4 *Parus* spp. already discussed [see *F.A.* 17 No. 1194].

Insects: Chemical Control (General)

See Nos. 1729, 1866, 1870, 1876, 1880, 1882, 1886, 1888, 1894, 1896, 1898, 1901, 1906, 1912, 1915, 1920, 1922, 1932.

1847. SCHWERDTFEGER, F. Nebelgeräte für den Forstschutz. **[Mist sprayers and generators for forest protection.]** *Forstarchiv* 25 (9), 1954 (223–4). [G.]

Lists, with some illustrations and a table of performances, German mist sprayers (Borchers, Chiron Sprühnebelgeräte) and vaporizers ('Swingfog', Merck Nebelgerät, and Chiron Heissgasnebelgerät).

1848. BURNETT, G. F., and THOMPSON, B. W. **Aircraft applications of insecticides in East Africa. X. An investigation of the behaviour of coarse aerosol clouds in woodland.** *Bull. ent. Res.* 47 (3), 1956 (495–524 + 4 photos). 12 refs.

A comparison of the kills of caged flies (*Musca* sp.) exposed at various heights in the open and in closed *Acacia xanthophloea* woodland, and a discussion of the validity of the technique, with statistical analysis.

1849. REISCH, J. Die Bekämpfung von Tannentriebwickler, Fichtenblattwespe, Feld- und Waldmaikäfer durch Starrflugzeuge. **[Control of *Cacoecia murinana, Lygaeonematus abietum, Melolontha melolontha* and *M. hippocastani* from aeroplanes.]** *Forst- u. Holzw.* 11 (19), 1956 (418–20). 11 refs. [G.]

Reports on control measures in difficult terrain in the Schwarzwald and in other parts of Baden, the types of aeroplanes, dusting and spraying equipment, and insecticides used. Costs/ha., assuming the application of 20 litres or kg. of insecticide, are given; they are in all cases considerably lower than for helicopters, and compare favourably with ground equipment.

1850. ANGUS, T. A. **Reaction of certain lepidopterous and hymenopterous larvae to *Bacillus sotto* toxin.** *Canad. Ent.* 88 (6), 1956 (280–3). 9 refs. O.R.S.

The experiments included trials with *Choristoneura fumiferana, Diprion hercyniae* and *Neodiprion* spp. These fed readily on foliage coated with the toxin and showed no susceptibility to it.

Insects: Other Means of Control

1851. BÜTTNER, H. Die Beeinträchtigung von Raupen einiger Forstschädlinge durch mineralische Düngung der Futterpflanzen. **[Injury to larvae of some forest pests from treating the food plants with mineral fertilizers.]** *Naturwissenschaften* 43 (19), 1956 (454–5). 8 refs. [G.] O.R.S.

In a study on larvae of *Lymantria monacha* and *Pristiphora abietina* fed on 3- to 10-year Spruce given different fertilizer treatments, Ca, N, and P increased mortality compared with controls fed on untreated Spruce, whereas K and Mn + B decreased mortality. The effect of fertilizer combinations varied with the individual constituents; with *L. monacha* the sex balance was also disturbed.

Orthoptera

1852. ENE, M. Două lăcuste dăunătoare perdelelor forestiere. **[Two locusts injurious to forest shelterbelts.]** *Rev. Pădurilor* 71 (2), 1956 (113–5). 7 refs. [Rum.rum.russ.g.]

Describes *Dociostaurus maroccanus* and *Calliptamus italicus*, which caused severe damage in 1953 to young shelterbelts in the neighbourhood of Turda (Transylvania), with notes on their parasites and predators and chemical control.

1853. VALDEYRON-FABRE, L. Observations sur la biologie de *Brachytrypes megacephalus* Lef. en Tunisie. **[Biology of *B. megacephalus* in Tunisia.]** *Rev. Path. vég.* 34 (3), 1955 (136–58). 13 refs. [F.] I.M.I.

Coniferous nursery stock is damaged by this cricket, which is parasitized by *Sphex xanthocerus*.

Thysanoptera

See Nos. 1835, 1841.

Hemiptera

See also Nos. 1260, 1835, 1837–8, 1841–2.

1854. HEINZE, K. Wanzenschäden (*Phylus coryli* L.) an Haselnuss. **[Damage to Hazel by *P. coryli*.]** *Anz. Schädlingsk.* 29 (11), 1956 (181). 1 ref. [G.]

Damage to young shoots and particularly water sprouts of Hazel was due to the activities of *P. coryli*, originally attracted to the Hazel by an aphid infestation. It was noted that *P. coryli*, besides preying on the aphids, also sucked sap from the Hazel leaves.

1855. MULLA, M. S. **Two mymarid egg parasites attacking *Typhlocyba* species in California.** *J. econ. Ent.* 49 (4), 1956 (438–41). 10 refs.

Descriptive and biological data on *Anagrus armatus negriceps* and *A. epos* and their parasitism in the field on the eggs of *T. prunicola* and *T. querci*.

1856. ***Adelges cooleyi*, an insect pest of Douglas Fir and Sitka Spruce.** *Leafl. For. Comm., Lond.* No. 2 (rev.) 1954. pp. 4. Price 4*d*.

1857. BALCH, R. E. **Damage caused by Balsam woolly aphid [*Adelges piceae*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (1).

Reports on a reconnaissance made in 1956 to determine the damage caused by this European insect to Balsam Fir in New Brunswick and Nova Scotia.

1858. BROWN, N. R., and CLARK, R. C. **Studies of predators of the Balsam woolly aphid *Adelges piceae* (Ratz.) (Homoptera: Adelgidae). I. Field identification of *Neoleucopis obscura* (Hal.), *Leucopina americana* (Mall.) and *Cremifania nigrocellulata* Cz. (Diptera, Chamaemyiidae).** *Canad. Ent.* 88 (6), 1956 (272–9). 9 refs. O.R.S.

1859. DELUCCHI, V., and PSCHORN-WALCHER, H. *Cremifania nigrocellulata* Czerny (Diptera, Chamaemyiidae), ein Räuber an *Dreyfusia* (*Adelges*) *piceae* Ratz. (*Hemiptera, Adelgidae*). **[*C. nigrocellulata*, a predator of *A. piceae*.]** *Z. angew. Ent.* 36 (1), 1954 (84–107). 12 refs. [G.g.f.] I.I.E.

Morphology and biology of this species, which is apparently common in all outbreaks of *A. piceae* in central Europe. Notes are also presented on methods of mass rearing and transport.

1860. EICHHORN, O. Eine neue Tannenlaus in Baden-Württemberg. **[A new Fir aphid in Baden-Württemberg.]** *Allg. Forst- u. Jagdztg.* 126 (5/6), 1955 (93–5). 5 refs. [G.e.]

Describes the occurrence of *Adelges prelli* in the country near Freiburg, particularly in mixed groups of *Abies nordmanniana* and *Picea orientalis*, but also on *Abies alba*.

1861. BRADLEY, G. A. **Three new species of the genus *Cinara* Curtis (Homoptera: Aphididae) from *Larix* spp.** *Canad. Ent.* 88 (8), 1956 (492–5). O.R.S.

C. spiculosa, C. subterranea and *C. lyallii*.

1862. **Felted Beech Coccus [*Cryptococcus fagi*.]** *Leafl. For. Comm., Lond.* No. 15, 1956. pp. 8. Price 6*d*.

Notes on life history, damage, and control.

1863. **Manuka blight.** *Rep. Dep. sci. industr. Res. N.Z. 1955/56*, 1956 (12).

Whereas *Leptospermum scoparium* (Manuka) has been almost wiped out in some areas by the scale insect *Eriococcus orariensis*, *L. ericoides* (Kanuka) is immune. The difference is apparently due to a difference in bark, that of Manuka being rough and affording harbourage to large populations, while the smoother bark of Kanuka limits the period for crawlers to become fixed. Surviving Manuka was found to be smooth-barked like Kanuka.

1864. SCHMUTTERER, H. Zur Kenntnis einiger wirtschaftlich wichtiger mitteleuropäischer *Eulecanium*-Arten (Homoptera: Coccoidea: Lecaniidae). **[Some economically important *Eulecanium* spp. from central Europe.]** *Z. angew. Ent.* 36 (1), 1954 (62–83). 34 refs. [G.g.] I.I.E.

Morphology, biology and ecology of *E. corni* (pest of *Robinia, Fraxinus, Ulmus, Prunus, Vitis* and *Ribes* spp.), *E. pulchrum* (pest of *Quercus spp.*), *E. arion* (pest of *Thuja occidentalis*) and *E. crudum* (pest of *Taxus baccata*). By far the most harmful is *E. corni*.

1865. SIPPELL, W. L. **Damage to Jack Pine by the Pine tortoise scale [*Toumeyella numismaticum*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (2).

A brief survey of damage in Ontario where this insect has recently appeared.

Lepidoptera

See also Nos. 1291, 1443, 1837–9, 1841, 1849–51.

1866. PURCEL, V. Combaterea aviochimica a omizilor in padürea Livadia. **[Aerial control of defoliators [of Oak] in Livadia forest.]** *Rev. Păduri-lor* 70 (7), 1955 (353–61). [Rum.]

Describes, and gives results of, an operation carried out in May–June 1954 in N. Transylvania for the control of *Malacosoma neustria, Nygmia phaeorrhoea*, and *Lymantria dispar*, by dusting from the air with 35% Nitroxan [BHC]. Mortality % was *M. neustria* 67·3, *N. phaeorrhoea* 39·7, and *L. dispar* 3·2.

1867. ROBERTS, E. G. **Grubs in the trunks of live Green Ash trees.** *J. For.* 54 (12), 1956 (846–7).

Borer damage in 22 dissected boles is described and discussed, the insects suspected being *Prionoxystus* spp. and *Cossula magnifica*. Further study is needed to determine the factors leading to infestation.

1868. MARTIGNONI, M. E. Über zwei Viruskrankheiten von Forstinsekten im Engadin. **[Two virus diseases of forest insects in the Engadine.]** *Mitteilungen der Schweizerischen Entomologischen Gesellschaft, Bern* 27 (2), 1954 (147–52). 16 refs. [G.e.] I.I.E.

Reports on virus infections of two Larch pests, a granulosis of *Eucosma griseana* and a polyhedrosis of *Oporinia autumnata*, and discusses classification, symptoms, particle size, etc.

1869. BLANKWAARDT, H. F. H. De populierenscheutboorder (*Epinotia* (*Gypsonoma*) *aceriana* Dup.). **[*G. aceriana*.]** *Ned. Boschb.-Tijdschr.* 27 (10), 1955 (266–73). 2 refs. [Du.e.]

Describes the life cycle of the insect and the nature of the damage by tunnelling in buds, leaf veins, petioles, and pith of the youngest parts of shoots, in a Poplar nursery in the Netherlands. The damage causes a month's delay in flushing, and complete destruction of shoots, cessation of growth or branching, reducing the number of shoots available for cuttings. Complete control was obtained with a DDT spray.

1870. WACHTENDORF, W. Zur Bekämpfung des Fichtenrindenwicklers *Laspeyresia pactolana* Zll. **[Control of *L. pactolana*.]** *Anz. Schädlingsk.* 29 (11), 1956 (177–9). 7 refs. [G.]

Brief reports are presented on trials with Systox, Metasystox, and preparations 4410 and 4455 of the Farbenfabrik Bayer, Leverkusen, in Spruce stands suffering infestations during 1953–55. All the insecticides gave satisfactory control, but 4455 was noteworthy, although not strictly a systematic insecticide, for its outstandingly good penetration and its comparatively low toxicity to humans and mammals. Concentrations of 0·1–0·2% gave 100% control. The best time for spraying is in dry weather in July–August during the first larval instar. Late summer spraying in dry weather also gave good results. Spring spraying is successful only if carried out immediately after the winter rest period.

1871. MILLER, W. E., and NEISWANDER, R. B. **The pitch twig moth [*Petrova comstockiana*] and its occurrence in Ohio.** *Res. Bull. Ohio agric. Exp. Sta.* No. 779, 1956. pp. 24. 26 refs.

1872. GREENBANK, D. O. **The role of climate and dispersal in the initiation of outbreaks of the Spruce budworm [*Choristoneura fumiferana*] in New Brunswick. I. The role of climate.** *Canad. J. Zool.* 34 (5), 1956 (453–76). 33 refs. O.R.S.

New Brunswick outbreaks of the Spruce budworm, which began in 1912 and 1949, are considered in relation to the theory of climatic release. Studies on a natural population show that larval development is more rapid in dry and sunny weather than in humid and cloudy weather. The outbreaks were preceded by dry and sunny summers during 4 or 5 consecutive years. Flower production became more frequent in periods of dry years and larvae that fed on ♂ flowers developed faster. It is postulated that the average fecundity of the budworm increases in the pre-outbreak years as the result of favourable climatic conditions and abnormal flower production. *From author's summary.*

1873. STILLWELL, M. A. **Pathological aspects of severe Spruce budworm attack.** *For. Sci.* 2 (3), 1956 (174–80). 5 refs.

[Cf. *F.A.* 17 No. 621.] In the Green River Watershed, New Brunswick, *Abies balsamea* with (*a*) forked tops, (*b*) marked crooks, with or without dead leaders, and (*c*) slight sweeps or crooks, were felled and dissected in order to relate size of buried leaders to extent of decay arising from the 1912–20 budworm outbreak (definitely referenced by growth rings at stump and near the seat of injury). All the (*a*) and (*b*) trees and none of the (*c*) showed decay entering through budworm injury—a useful pointer for the tending of Balsam Fir damaged in the present outbreak. Buried leaders, ⩾ 5 years old or 0·5 in. diam., were invariably, and those younger and smaller were never, seats of origin for decay. Comprehensive data are tabulated for 19 stems each of (*a*) and (*b*).

1874. **[Effect of *Tortrix viridana* on natural regeneration of Oak.]** *Rep. Nat. Conserv., Lond. 1955/56*, 1956 (10).

One of the factors responsible for the poor regeneration of Lake District Oak woods may be a poor supply of acorns resulting from attacks of *T. viridana* caterpillars which, besides causing defoliation, are reported to feed on Oak flowers. Pilot experiments on chemical control were carried out in an infested wood, and successful larval control obtained on selected branches by spraying with DDT or Pb arsenate. The sprayed branches yielded considerably more acorns than controls. Future investigations will be aimed at developing control measures suitable for use in nature reserves where, if insecticides were to be used, a high specificity and short residual action would be desirable in order to avoid excessive damage to the insect fauna as a whole.

1875. BOGAVAC, M. Štetni plamenci na hrastu. **[*Acrobasis* spp. attacking Oaks.]** *Zašt. Bilja* No. 32, 1955 (103–4). [Serb.e.] I.M.I.

On Mt. Kosmaj, Serbia, heavy joint attack by *A. consociella* and *A. tumidana* was observed in 1954 in a mixed forest where *Quercus conferta* and *Q. cerris* are the dominant species. Brief notes are given on the biology of these moths.

1876. OSSOWSKI, L. L. J. **Spraying experiments with insecticides against Wattle bagworm (*Acanthopsyche junodi* Heyl.).** *Rep. Wattle Res. Inst. S. Afr. 1955/56*, 1956 (42–5). 1 ref.

Single trees were sprayed from the ground with endrin, toxaphene, DDT and 'R x 2' (a mixture of allyl derivatives of polyglycerine), in light diesel oil at 0·67 oz./gal. for the first and 1 lb./gal. for the rest, all at 3 gal./acre. Early and later instars were treated separately. The first two poisons were also tested in spraying from the air (same strengths and dosage). The results were discounted for natural mortality. No significant differences were found in the kills of early instars but endrin gave a higher kill of later instars. From the air, both endrin and toxaphene may give high kills where application is even and penetration (open stands) is good. Otherwise defoliation and the carry-over of infestation will not be prevented.

1877. ŠOROHOV, P. I. Sibirskiĭ šelkoprjad. **[*Dendrolimus sibiricus*.]** *Priroda, Moskva* 45 (8), 1956 (105–7). [Russ.] A.P.B.

After a drought in May and June 1954, a mass flight took place in the Tomsk, Altaĭsk, Krasnojarsk and Kemerovo regions. The autumn of 1954 was cold and wet, and most of the larvae overwintered in the 2nd instar. Although these were not expected to pupate until 1956, up to 70% of them pupated in June 1955 and emerged in July, producing a new generation of larvae by early August. These in turn overwintered in the 2nd or 3rd instar and many had pupated by 1 June 1956. Evidence from recent outbreaks in various regions from Tomsk to the Maritime Province indicates the need for some revision of the view that definite local races of *D. sibiricus* exist, each with its definite host preference (species of *Abies*, *Pinus*, *Larix* and *Picea*). As dusting with 5% DDT is effective only against young larvae, the present occurrence of overlapping generations makes control more difficult.

1878. BATZER, H. O., and WATERS, W. E. **Forest tent caterpillar [*Malacosoma disstria*].** *For. Pest Leafl. U.S. For. Serv.* No. 9, 1956. pp. 4. 6 refs.

1879. COLE, W. E. **Biological observations on the Pine butterfly [*Neophasia menapia*] during an outbreak in Southern Idaho 1953–1954.** *Res. Note Intermt. For. Range Exp. Sta.* No. 29, 1956. pp. 7. 6 refs.

1880. COLE, W. E. **Surveys and control methods of the Pine butterfly during an outbreak in Southern Idaho, 1953–1954.** *Res. Note Intermt. For. Range Exp. Sta.* No. 30, 1956. pp. 9 + 1 map. 5 refs.

[Cf. *F.A.* 17 No. 626.] After an outbreak of *Neophasia menapia* in 1955, heavily infested areas were determined by visual reconnaissance from the air, and the degree of infestation assessed by a ground survey of eggs. For control purposes the

infested area was divided into two units, and a total of 30 sampling lines, each with 10–22 trees at 5-chain intervals, were established to determine the larval populations before and after spraying. Two twigs were taken from each tree. Spraying from the air took place when the larvae were in the 1st and 2nd instars and 12½% DDT in fuel oil was used at a dosage of 1 gal./acre. Mortality averaged 99·4% for one, and 99·7% for the other unit; most of the larvae died on the first day after spraying.

1881. CROOKE, M. **Host of the overwintering generation of *Trichogramma evanescens* Westw. (Hym. Trichogrammidae).** *Ent. mon. Mag.* 92 (1110), 1956 (368).

Three adults of this parasite of several important forest pests were hatched from a clutch of *Bupalus piniarius* eggs laid in 1955 and collected April 1956.

1882. HEQVIST, K.-J. Studier över lindmätaren (*Erannis defoliaria* L.) och dess uppträdande i Skåne år 1948. **[The occurrence of *E. defoliaria* in Skåne in 1948.]** *Medd. SkogsforsknInst., Stockh.* 46 (8), 1956. pp. 19. 9 refs. [Sw.sw.g.*g.*] Price *Kr.*1.

Deals with biology, habits, hosts, enemies and injuries observed in S. Sweden from 1947 to 1949. Contrary to statements in the literature, most eggs were found under moss and lichen at the crown base, whence the newly hatched larvae quickly moved into the crown or migrated to other trees. Sample counts established 8 sound pupae/sq. m. as the critical density for complete defoliation in 50- to 60-year-old Beech stands. Aerial dusting with 15 kg. DDT/ha. gave good control.

1883. ***Operophtera brumata* (L.) (Winter moth).** *Distr. Maps Insect Pests* (*Ser. A*) No. 69, 1956. pp. [2].

1884. REEKS, W. A. **Sequential sampling for larvae of the winter moth, *Operophtera brumata* (Linn.) (Lepidoptera: Geometridae).** *Canad. Ent.* 88 6), 1956 (241–6). 9 refs. O.R.S.

Presents an example of the application of the sequential technique [cf. *F.A.* 16 No. 1976] in sampling winter moth on *Quercus rubra.*

1885. CARROLL, W. J. **History of the Hemlock looper, *Lambdina fiscellaria fiscellaria* (Guen.) (Lepidoptera: Geometridae) in Newfoundland, and notes on its biology.** *Canad. Ent.* 88 (10), 1956 (587–99). 11 refs. O.R.S.

Four periods of severe attack have been recorded in Newfoundland since 1912, with severe mortality of Balsam Fir in most cases. Outbreaks usually occur in mature or overmature stands and an increase in the Spruce content of the stand seems to result in a corresponding decrease in susceptibility to attack. Notes are presented on life history, habits and natural control of the insect; larval disease has been an important factor in terminating several outbreaks. *From author's summary.*

1886. **Saddled prominent [caterpillar].** *Rep. N.Y. St. Conserv. Dep. 1955*, 1956 (81).

An outbreak of *Heterocampa guttivitta*, resulting in defoliation of Beech, Sugar Maple, and White Birch over an area of ca. 2300 acres, was successfully treated by spraying from the air with DDT in kerosene at a rate of 1 lb. DDT/acre.

1887. BOGAVAC, M. ***Rogas hyphantriae* Gahan.** *Zašt. Bilja* No. 32, 1955 (17–30 + 4 photos). 9 refs. [Serb.serb.e.*e.*] I.M.I.

Notes on the morphology, life history, and hyperparasites of this braconid parasite imported from N. America for the biological control of *Hyphantria cunea* in Jugoslavia.

1888. REEKS, W. A., and SMITH, C. C. **The satin moth, *Stilpnotia salicis* (L.), in the Maritime Provinces and observations on its control by parasites and spraying.** *Canad. Ent.* 88 (10), 1956 (565–79). 18 refs. O.R.S.

This moth was first reported in the Maritimes in 1930, and subsequently spread through most of the settled areas which use Poplars as shade trees. In the past 25 years, 3 outbreaks lasting 4–9 years have occurred in 3 different localities. Low winter temperature is the most important climatic control factor; temperatures below — 30° F. will kill many hibernating larvae. Native parasites and disease organisms offer slight control value, but in some areas high parasitization by two introduced parasites was noticed, viz. a braconid, *Apanteles solitarius*, and a tachinid, *Compsilura concinnata.* The effectiveness of *A. solitarius* is sometimes prejudiced by the action of secondary parasites, while *C. concinnata* is dependent on the abundance of alternate hosts for overwintering. The insect can be controlled easily by spraying about the time the leaves are fully developed in spring, or in early August before hatching is at its peak. An advantage of summer spraying is that it is only necessary to treat the bole and lower branches, the young larvae being killed by the direct and residual effect of DDT during migration over the bark surface. Spray formulations for spring and summer spraying are given. *From authors' summary.*

1889. CONSTANTIN, M. O insectă entomofagă care distruge ouăle de *Lymantria dispar* L. în ocolul Feteşti. **[An entomophagous insect destroying the eggs of *L. dispar* in the Feteşti forest circle.]** *Rev. Pădurilor* 71 (3), 1956 (168–9). 3 refs. [Rum.]

Describes the predation by the larva of a *Dermestes* sp. [*lardarius*?, cf. *F.A.* 13 No. 4039] on the egg clusters of *L. dispar*, with some numerical data on numbers of predators per egg-cluster and height on the tree at which both occur.

1890. DŽUTEVSKI, B., and ČAKAR, L. Masovna pojava *Lymantria monacha* L. u. bukovim šumama Makedonije. **[The mass appearance of *L. monacha* in the Beech forests of Macedonia.]** *Zašt. Bilja* No. 32, 1955 (55–60). 2 refs. [Serb. serb.e.*e.*] I.M.I.

In June 1955 heavy attacks by *L. monacha* were observed in 40- to 60-year-old Beech forests in the districts of Gostivar, Kičevo, Ohrid and Titov Veles. Mass flight took place at the end of July and oviposition at the beginning of August.

1891. BILIOTTI, E. Biologie de *Phryxe caudata* Rondani (Dipt. Larvaevoridae) parasite de la chenille processionaire du pin (*Thaumetopoea pityocampa* Schiff.). **[Biology of *P. caudata*, a parasite of**

T. pityocampa.] *Rev. Path. vég.* 35 (1), 1956 (50–65). 10 refs. [F.] I.M.I.

The biology, endoparasitic life and mortality, specificity, concurrence of parasite with vulnerable host stage in time and place, and hyperparasites are detailed with field and laboratory data.

Coleoptera

See also Nos. 1261–4, 1805, 1836, 1842, 1849.

1892. Simmonds, F. J. **An investigation of the possibilities of biological control of *Mellittomma insulare* Fairm. (Coleoptera, Lymexylonidae), a serious pest of Coconut in the Seychelles.** *Bull. ent. Res.* 47 (4), 1956 (685–702 + 2 photos). 44 refs.

In search for parasites of this very important stem borer of young Coconuts, indigenous to the Seychelles and having no natural enemies there, records of other Lymexylonidae (4 genera) and of their host plants are listed. The latter include species of *Liriodendron*, Oak, Chestnut, Poplar, *Mora*, *Triplochiton*, *Terminalia*, *Bombax*, African and American Meliaceae, Teak, Euphorbiaceae, Anacardiaceae, Burseraceae, Leguminosae, and Eucalypts. These insects are rarely collected but some may prove common. Among these is *Atractocerus brasiliensis*, a borer of freshly felled Mango logs, in Trinidad; its anatomy is illustrated and its biology outlined. In the tunnels of *A. brevicornis* (pan-African), which is recorded from Mahogany logs in the Gold Coast, large elaterid larvae thought to be predacious on it have been noted.

1893. Inou(y)e, M., and Yamaguchi, H. **[Analysis of the increase in beetle population in the storm-swept areas in the national forest of Hokkaido. I.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (72–94). 20 refs. [Jap.jap.e.e.]

After the storm of May, a detailed examination was made in mid-June and Sept. 1954, of *Abies sachalinensis*, *Picea jezoensis* and *P. glehnii*. Data are tabulated for cut logs, broken stems, uprooted stems, slash, stumps and residual standing trees. Uprooted trees, especially Spruces, were least attacked, and broken stems only extensively so by the later date. *Monochamus* spp., *Ips typographus* f. *japonicus* and *Polygraphus* spp. were chiefly concerned. *From authors' summary.*

1894. Postner, M. Zur Biologie und Bekämpfung des kleinen Pappelbockes *Saperda populnea* L. (Cerambycidae). **[The biology and control of *S. populnea*.]** *Z. angew. Ent.* 36 (2), 1954 (156–77). 30 refs. [G.g.] I.I.E.

Presents notes on the life history and biology of *S. populnea* and on the resistance of Poplars on good sites, with the results of experiments in various methods of chemical control. To prevent oviposition, young trees may be sprayed with 3% active Gesarol in the middle of May. To control newly emerged larvae, painting or spraying with a 9/1 mixture of crude petroleum + Hexa Mischöl BZ8050 (Merck) has proved successful. [Cf. *F.A.* 17 No. 3050.]

1895. Juutinen, P. Zur Biologie und forstlichen Bedeutung der Fichtenböcke (*Tetropium* Kirby) in Finnland. **[The biology of the genus *Tetropium* and its importance to forestry in Finland.]** *Acta Entomologica Fennica, Helsinki* 1955 (2), (6–112). 108 refs. [G.g.fi.] I.I.E.

A monograph, based on literature and on field and laboratory investigations, concentrating on the role of *T. castaneum* and *T. fuscum* as secondary pests of Spruce all over Finland. In addition to the bionomics and climatology of the insect, the predisposing conditions of the host, e.g. fungus or insect attack, snow or wind damage, are discussed, as also the insects' later completion of the destruction, with diagrams showing the sequence of attack of the different agents. Though contributing to, and accelerating, the process of killing Spruce, which they prefer to attack at a stage when desiccation begins to be manifest, these beetles are not considered of major forestry importance in Finland, where real epidemics are so far unknown. Preventive control by silvicultural measures, e.g. control of *Fomes annosus*, and removal of susceptible trees is recommended.

1896. Speers, C. F. **Pales weevil control with insecticides: first year results.** *Res. Note Stheast. For. Exp. Sta.* No. 96, 1956. pp. 2.

On a site in N. Carolina cleared the previous autumn, 2% aldrin, dieldrin, heptachlor or BHC, and 5% chlordane or DDT, all used as sprays, the first 3 also used as dips, and 5% granular heptachlor on vermiculite spread round each seedling, significantly reduced mortality of planted Pine seedlings [no species given]. Sprays were most effective and most expensive (as treatment could not be combined with planting), and dipping least. BHC and dieldrin sprays, and dieldrin dips, proved phytotoxic at the concentration used.

1897. Eliescu, G., and Negru, Ş. *Magdalis rufa* Germ. (Col., Curcul.) un dăunător forestier nou pentru fauna R.P.R. **[*M. rufa*, a new forest pest in Rumania.]** *Rev. Pădurilor* 71 (3), 1956 (179). 4 refs. [Rum.]

Recorded for the first time in 1951 in Pine plantations.

1898. Vollmann, M. Der Schmalbauchrüssler *Phyllobius oblongus* L. (Col. Curc.). Ein Beitrag zur Biologie und Bekämpfung. **[*P. oblongus*, its biology and control.]** *Z. angew. Ent.* 36 (2), 1954 (117–55). 74 refs. [G.g.] I.I.E.

This polyphagous species is mainly a pest of fruit trees, but will also feed on forest species, particularly young Oak. It can be controlled with DDT or E605.

1899. Godwin, P. A., and Bean, J. L. **Predicting emergence of the White Pine weevil from hibernation.** *For. Sci.* 2 (3), 1956 (187–9). 9 refs.

For the better timing of aerial spraying, the correlation between the % of *Pissodes strobi* moving up from the litter to feed in the crowns, and the rising spring temperature, was investigated over a period of 3 years. This movement begins at 35–40° F., with reversals if temperatures drop. Emergence counts were plotted against 4 temperature values, of which cumulative degrees above

40° F. between 6 a.m. and 6 p.m. gave the best correlation. The general regression curve deduced is given by the equation y (% emergence) $= -5{\cdot}63 + 0{\cdot}09x - 0{\cdot}000019x^2$, which is plotted along with its 67 and 95% fiduciary ranges. An average of 50% emergence should be expected at about 730 cumulative degrees above 40° with $\pm$ 6% for the former range and $\pm$ 12% for the latter. Temperature was recorded 12 in. above ground with a hydrothermograph in a screen.

1900. NUORTEVA, M. Hakkuiden vaikutuksesta kaarnakuoridisten esiintymiseen eräällä metsäalueella etelä Hämeessä. [**The influence of fellings on the occurrence of barkbeetles in South Finland (South-Häme).**] *Repr.* from *Acta for. fenn.* 65 (4), 1956. pp. 38. 28 refs. [Fi.fi.g.*g*.]

Presents data collected in sound natural forests on 140 sample plots of 300 sq. m. each, on barkbeetles and weevils (*Pissodes* spp.) found on Spruce, Pine and hardwoods (chiefly Birch and Alder). Of the 25 barkbeetle species recorded from 66 plots, *Dryocoetes autographus* occurred on the greatest number of plots, while *Pityogenes chalcographus* was most frequent, measured by the surface covered by its galleries. Two-thirds of barkbeetle places were found in slash, felled trees etc., but only 18% of weevils were found in this material. Plots where felling had taken place the previous winter contained most beetles. Primary barkbeetle pests of Spruce showed some increase over secondary species as a result of fellings; observations on Pine were insufficient for conclusions to be drawn.

1901. RÜHM, W. Kann der Riesenbastkäfer (*Dendroctonus micans* Kug.) in Schleswig-Holstein erfolgreich bekämpft werden? [**Can *D. micans* be successfully controlled in Schleswig-Holstein?**] *Forst- u. Holzw.* 11 (19), 1956 (424–7). 13 refs. [G.]

Discusses the difficulties of discovery and the lack of success of commonly applied methods—chiefly felling, with burning of bark and branches—and recommends Mobe T, using knapsack sprayers with long tubes capable of reaching 10 m. up the stem, and treatment of stumps with persistent contact poison.

1902. BECKER, G. Beiträge zur Kenntnis der *Dendroctonus*-Arten in Guatemala. [**The *Dendroctonus* species of Guatemala.**] *Z. angew. Ent.* 36 (1), 1954 (20–61). [G.g.] I.I.E.

Notes on the Guatemalan species, of which *D. adjunctus* is the most widespread and harmful, the type of damage inflicted, the pattern of larval galleries, life history, pests and predators, with observations on the severity of an outbreak and mortality, in a stand of *Pinus rudis* near Quezaltenango on the edge of the Samalá valley.

1903. MASSEY, C. L. **Southwest bug damage tops $12 million.** *Timberman* 58 (1*A*), 1956 (110).

Estimates of the 1955 loss from insects in millions of [bd.] ft. in the natural forests of the New Mexico and Arizona region are quoted from Massey's report (the first from the region) as: Fir engraver beetle [*Scolytus ventralis*] 5·2; southwestern Pine beetle [*Dendroctonus barberi*] 118·8; other Pine barkbeetles 0·3; Douglas Fir beetle [*Dendroctonus pseudotsugae*] 30·6; Engelmann Spruce beetle [*Dendroctonus engelmannii*] 3·2; other barkbeetles 14·2; total 172·3. The whole sale values lost are put at 6–7 times the stumpage ($2 million).

1904. KNIGHT, F. B., MCCAMBRIDGE, W. F., and WILFORD, B. H. **Estimating Engelmann Spruce beetle infestations in the Central Rocky Mountains.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 25, 1956. pp. 12. 2 refs.

Describes the procedure, using parallel cruise lines with circular $\frac{1}{10}$-acre plots at 2-chain intervals; $\frac{1}{20}$-acre plots proved useful with heavy infestations, but plots $> \frac{1}{10}$ acre and ordinary strip methods were less accurate. Tables developed from a regression analysis of factors affecting accuracy were used successfully as a guide for sampling intensity in the field.

1905. MCCOMB, D. **Relationship between trap tree felling dates and subsequent Engelmann Spruce beetle attack.** *Res. Note Intermt. For. Range Exp. Sta.* No. 23, 1955. pp. 5. 1 ref.

In the N. Rocky Mountains, on 4 areas infested by *Dendroctonus engelmanni*, 10–17 trees were felled as traps at 4 different times—Sept. 1953, Oct. 1953, April–May 1954, and June 1954. In Sept. 1954, five bark samples 6 × 24 in. were removed from each tree and the number of beetle attacks underneath were counted. Their average number was four times as great for trees felled in June as for trees felled in September, and trees felled in October had more attacks than those felled in April. Trees felled in September were found to be mostly occupied by developing broods of *Ips* spp.

1906. SMITH, R. H. **Studies in the control of the black turpentine beetle in Southern Pine.** *Abstr.* in *Proceedings, 51st Annual Convention, Association of Southern Agricultural Workers, Dallas 1954*, 1954 (100). C.G.B.

$C_2H_4Br_2$ was the most effective material tested for killing broods already established in the bark. BHC, only slightly less effective, was suitable as a complementary in preventing further attack. The more common phytocides, applied in frills, were not very successful preventives. $NH_4F.HF$ proved the best.

1907. **Protection against insects.** *Rep. For. Dep. Brit. Hond. 1955*, 1956 (8–9).

Young *Pinus caribaea* growing in very dense natural regeneration was attacked by a species of *Ips*, trees 5–7 ft. high being attacked and killed in small patches. The attack may have been secondary, following severe competition. The attacks diminished as the dry weather began, and the May fire that burnt over the area appears to have put an end to them.

1908. **Forest insect investigations in State plantations following silvicultural thinning.** *Rep. N.Y. St. Conserv. Dep. 1955*, 1956 (80).

The methods of thinning under study are axe felling, axe girdling, and poisoning with Na arsenite. Various bark beetles and borers have been found attacking treated trees in varying degrees. In two

districts *Ips pini* was found attacking live *Pinus resinosa* thinned by the axe-girdling method.

1909. NEUŽILOVA, A. Přispěvek k znalosti cizopasných hub kůrovců *Ips typographus*. [**Notes on parasitic fungi of *I. typographus*.**] *Preslia* 28 (3), 1956 (273–5). 8 refs. [Cz.russ.g.*g.*] A.P.B.

Cultures from infected beetles yielded *Beauveria bassiana*, *B. densa*, *B. globulifera* and *Spicaria farinosa*.

1910. NUORTEVA, M. Über den Fichtenstamm-Bastkäfer, *Hylurgops palliatus* Gyll. und seine Insektenfeinde. [***H. palliatus* and its insect enemies.**] *Acta Entomologica Fennica*, *Helsinki* No. 13, 1956. pp. 118. 106 refs. [G.g.fi.]

A study, based on field and laboratory observation, mainly in S. Finland, to investigate the possibility of favouring this harmless, secondary parasite of Spruce as an alternative host or prey for polyphagous enemies of barkbeetles, in order to maintain a high population of such useful insects. Present methods of logging, while controlling the barkbeetles, also severely reduce their parasites and predators, leaving outbreaks caused by windthrows etc. without effective check.

1911. NUORTEVA, M. Versuche über den Einfluss der Bevölkerungsdichte auf die Nachkommenzahl des grossen Waldgärtners *Blastophagus piniperda* L. [**Experiments on the effect of population density on the number of progeny of *Myelophilus piniperda*.**] *Annales Entomologici Fennici*, *Helsinki* 20 (4), 1954 (1955), (184–9). 6 refs. [G.] I.I.E.

Experiments with different numbers of beetles bred in cages formed from wire-netting round 1·5-m.-high stumps of slender, dominated Pines (the favoured objects of attack) showed that numbers of progeny per gallery tended to decline at a density of $>$ 30 galleries/sq. m. while total progeny per sq. m. declined at $>$ 60 galleries/sq. m., a figure still considerably below average field density.

1912. NAGEL, R. H. **Chemical control of the Fir engraver [*Scolytus ventralis*].** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 23, 1956. pp. 3. 1 ref.

After an outbreak of *S. ventralis* in stands of *Abies concolor* in the Sandia mountains, laboratory tests were carried out at Fort Collins, Colorado. The bark on infested bolts, 18 in. long, and 12–16 in. in diam., was sprayed till it dripped, with commercial-grade $C_2H_4Br_2$ at 0·5, 1 or 2 lb./5 gal. oil, and *o*-dichlorobenzene at 6 or 8 lb./5 gal. oil. Each treatment was used on 6 bolts. In field tests, 6 infested trees were sprayed with 1 lb., and 6 with 2 lb. $C_2H_4Br_2$/5 gal. oil. Results show that 1 and 2 lb. $C_2H_4Br_2$, or 8 lb. *o*-dichlorobenzene, per 5 gal. fuel oil, are effective against *S. ventralis*.

1913. LYONS, L. A. **Insects affecting seed production in Red Pine. Part I. *Conophthorus resinosae* Hopk. (Coleoptera: Scolytidae).** *Canad. Ent.* 88 (10), 1956 (599–608). 24 refs. O.R.S.

Life history, habits and natural control of *C. resinosae*, the most destructive of the insects found inhabiting Red Pine cones in central and southern Ontario during 1950–54.

1914. CHARARAS, C. Observations sur *Xylechinus pilosus* Ratz., Col. Scolytide nouveau pour la France. [**Observations on *X. pilosus*, a species new to France.**] *Rev. Path. vég.* 35 (2), 1956 (93–101). [F.] I.M.I.

Describes the morphology and life history of this insect, found on the damp underside of logs, on the dying (lower crown) branches of healthy trees and in heavily shaded and dense stands of *Picea abies*.

1915. BRAMMANIS, L. Bidrag till kännedomen om för skogen skadliga bladhorningar i Sverige. II. Pingborren, *Amphimallus solstitialis*. [**Lamellicorn beetles injurious to forests in Sweden. II. *A. solstitialis*.**] *Medd. SkogsforsknInst.*, *Stockh.* 46 (4), 1956. pp. 123. 153 refs. [Sw.sw.g.*g.*] Price *Kr.*6.

The investigation followed lines similar to those of Part I [see *F.A.* 14 No. 515]. Habitats and preventive control measures recommended are similar, but damage is usually more severe, and for chemical control (chiefly with BHC preparations) higher dosages are often necessary. Observations on two heavily infested Pine plantations, and experiments with varying BHC dosages and modes of application, using Pine and Spruce transplants in a heavily infested abandoned nursery, are described. Treatment of whole areas before planting, plant-hole poisoning, dusting and dipping of roots, all gave good control, but not the application of poison in holes or furrows alongside existing plant rows. Dusting of the soil with DDT or BHC, though successful in a cage, did not prevent oviposition in field experiments. Overdoses of BHC (50 g. γ/are) appear to stimulate Pines and temporarily harm Spruce seedlings.

1916. SCHWERDTFEGER, F., and DARUP, J. Untersuchungen über den Massenwechsel des Maikäfers. [**On the population fluctuations of cockchafers.**] *Allg. Forst- u. Jagdztg.* 126 (8/9), 1955 (162–75). 21 refs. [G.g.e.]

The authors have examined records of cockchafer damage (chiefly *Melolontha hippocastani*) covering nearly 100 years, from 6 N.E. German districts. Though variation in the length of generations somewhat blurs the picture, general population trends can be discerned, with local variations for the length of the various phases of the cycle. Abnormally low temperatures during the flight and feeding months coincided with periods of decline or latency, and warm weather during these times with periods of severe damage. No relation was found between precipitation and population dynamics. *From authors' summary.*

1917. HURPIN, B. Influence de la température et de l'humidité du sol sur le développement embryonnaire du hanneton commun (*Melolontha melolontha* L.). [**The influence of soil temperature and moisture on the development of cockchafer embryos.**] *Rev. Path. vég.* 35 (2), 1956 (75–92). 17 refs. [F.] I.M.I.

Field observation and controlled experiments, here described, suggest that the population level of cockchafers chiefly depends on the climatic factors of the summer following the flight. Natural

mortality in the embryo sometimes equals that of a very efficient control treatment, a point to remember when planning counter measures.

1918. WIKÉN, T., *et al.* Über die Ergebnisse der in der Schweiz im Jahre 1953 durchgeführten Freilandversuche zur mikrobiologischen Bekämpfung des Engerlings von *Melolontha melolontha* L. (= *Melolontha vulgaris* F.). [**Field experiments in Switzerland in 1953 in the biological control of *M. melolontha* grubs.**] *Z. angew. Ent.* 36 (1), 1954 (1–19). 16 refs. [G.g.f.] I.I.E.

A large number of bacteria and pathogenic fungi were isolated from diseased cockchafer grubs, and experiments in control were attempted by inoculating the ground in infested areas. The success of the treatment varied between 41·8 and 59·4% in the bacteria-treated plots and between 33·7 and 65·6% in the fungus-treated plots. Simultaneous treatment with both fungi and bacteria resulted in 37·5 to 49·3% success.

1919. **White grubs kill young Pine trees.** *Forests and People, Alexandria, La.* 6 (3), 1956 (40–1).

Larvae (white grubs) of a species of *Phyllophaga* do serious damage to young planted Pines in Louisiana by chewing off their lateral and tap roots, mortality varying from 5 to 100%, depending on the concentration of grubs.

Hymenoptera

See also Nos. 1265–7, 1836–7, 1849–51.

1920. HEQVIST, K.-J. Studier över större granspinnarstekeln (*Cephaleia abietis* L.) och dess uppträdande i Skåne. [***Cephaleia abietis* and its occurrence in Skåne.**] *Medd. SkogsforsknInst., Stockh.* 46 (5), 1956. pp. 54. 43 refs. [Sw.sw.g.*g.*] Price *Kr.*3.

A monograph containing, in addition to a description of the species, its biology, habits, parasites etc., a key to other species of the genus found in Sweden. Complete defoliation by the larvae was rare, and even less often led to the death of the tree. Nor were serious secondary barkbeetle outbreaks observed in Sweden. Loss of increment is difficult to estimate, but was probably considerable. Outbreaks in 1943, 1947 and 1950 and control measures adopted are described. As dusting from the ground with Ca arsenate was not very successful, dusting by helicopter, using DDT, was tried in 1947, resulting in kills of 41–64%. In 1950, when 10% BHC was added the average kill was 60%. Further research into effective poisons and modes of application is recommended.

1921. HEIN, G. Een rode dennenbladwespenplaag. [**An outbreak of *Neodiprion sertifer* [in the Netherlands 1949–54].**] *Ned. Boschb.-Tijdschr.* 28 (11; 12), 1956 (257–65; 285–97). 50 refs. [Du.e.]

Discusses the biology of the insect, the development of the attack in question, and the effect of non-hatching of eggs, bacterial damage to larvae, activity by birds and mice, and parasitization by *Microcryptus basizonus* and *Exenterus marginatorius*. Observations in 1953 showed that eggs were rarely laid on narrow needles (less than 1·6 mm.) and that on wider ones the presence of supporting and protecting elements (as in coarse, tough needles, with wax layers round stomata) reduced egg-laying. Laboratory and field observations showed that egg-laying increased with the amount of water in the needles up to a certain point (corresponding to an approximate weight-loss of 62–64% during drying at 45–60° C.). and then fell sharply. The possibility that heavy infestation may cause changes in water relationships, leading in turn to a sudden end to the attack, is discussed. Trees at the stand edge, and open, poor-quality stands are chiefly attacked. First-year needles are eaten, but tree growth is generally only slightly retarded. Control is not, so far, considered necessary in the Netherlands.

1922. **Pine sawflies.** *Rep. N.Y. St. Conserv. Dep. 1955*, 1956 (82).

In an attempt to control heavy infestations of *Neodiprion sertifer* in young plantations of *Pinus resinosa*, 6–25 ft., high in the southern part of N.Y. State, a virus-disease solution was hand-sprayed on to colonies of larvae feeding on Red Pine. Results were to be checked in the following spring. *Neodiprion nanulus* has been present for nearly 20 years on *P. resinosa* plantations in the northern part of the State but caused little damage until recently. Medium to heavy defoliation has occurred in some plantations for several years past, and a total of 950 acres of heavily infested plantations was sprayed from the air with a solution of DDT in kerosene at ½ lb. DDT/acre, which effected a marked reduction in sawfly populations.

1923. HETRICK, L. A. **Life history studies of five species of *Neodiprion* sawflies.** *For. Sci.* 2 (3), 1956 (181–5). 7 refs.

Recent work on the taxonomy of American sawflies has cleared up much confusion and ambiguity. In the light of this, the author has gone through available records of laboratory rearing of these insects and referred the data to the correct species. Notes, including characters and habits for field identification, are given for *N. taeda taeda, N. abbottii, N. hetricki, N. pratti pratti*, on *Pinus taeda* and *N. exitans* on *P. echinata.*

1924. IVES, W. G. H. **Wandering of Larch sawfly larvae before spinning cocoons.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (3).

Experiments indicate that, when conditions for cocoon spinning are favourable, larvae of *Pristiphora erichsonii* do not wander far—of 3689 recovered, 76·4% had not moved from the point of release, 19·4% had moved 6 in., 2·2% had moved 12 in., and only 2% further than that.

1925. BRANDT, H. Kahlfrass von Trauerweiden durch *Pteronidea salicis* L. (Hym. Tenthredinidae). [**Defoliation of Weeping Willows by *P. salicis*.**] *Nachrichtenblatt der Bayerischen Entomologen, München* 3 (7), 1954 (72). [G.] L.E.

A note on complete defoliation observed in early autumn 1949 in S.W. Bavaria, caused by this pest, mass outbreaks of which are rare.

1926. Novitzky, S. Beiträge zur Kenntnis der Nadelholz-Samenzerstörer. 1. Zedernsamen-Chalcidier—*Megastigmus schimitscheki* nov. spec. [**Conifer seed pests. 1. *M. schimitscheki*.**] *Z. angew. Ent.* 36 (2), 1954 (218–24). 4 refs. [G.] I.I.E.

A description of this pest, found on seeds of *Cedrus libani* in the Taurus Mts. and of the subsp. *libanotica* found in the Lebanon.

1927. Hussey, N. W. **The extent of seed-loss in Douglas Fir caused by *Megastigmus*.** *Scot. For.* 10 (4), 1956 (191–7). 2 refs.

Intensive studies were carried out in 1950–53, in an isolated group of 46 Douglas Firs at Bedgebury, on the % of seed attacked and on the bionomics of *M. spermotrophus*. In the absence of a parasite, the only factor acting in *Megastigmus* populations in a density-regulating manner is early larval mortality, the operation of which demands that sound seed must be attacked and therefore lost. The only factor preventing almost 100% loss of sound seed in these circumstances is limitation of egg supply. Study of fecundity suggests that *Megastigmus* is strongly affected by crowding, mean fecundity ranging from 109 with a population density of 0·2 ♀s/100 seeds to 1·2 with a density of 52 ♀s/100 seeds. Study of cone samples from a number of stands in Scotland over successive years suggests that should a good seed-year follow a series of poor ones, there may be so many seeds as to be beyond the potential egg supply of the emergent *Megastigmus*. Although seed infestation may remain high in the presence of the parasite *Amblerus apicalis*, yet parasitization may make all the difference in a good seed year by reducing the magnification of the cone crop necessary to exceed the potential *Megastigmus* fecundity. In practice, the forester who wishes to collect seed from stands known to be heavily infested with *Megastigmus* should await a good seed-year following a succession of poor crops. If such years have also been characterized by early or late seasons, the chances of lower seed infestation are considerably increased.

1928. Mathur, R. N., and Hussey, N. W. **A new species of *Bootanomyia* (Chalcidoidea: Torymidae, Megastigminae) from India.** *Indian For. Bull.* (*n.s.*) No. 212, 1956. pp. 3 + 1 page of drawings. Price *As.*10 or 1*s.*

B. orientalis sp. nov., bred from seeds of *Casuarina equisetifolia*.

1929. Hayward, J. F. **A preliminary note on Pleistocene plant galls from the Lea valley and elsewhere.** *Ent. mon. Mag.* 92 (1107), 1956 (301–3). 5 refs.

Tentative identifications are referred to galls of *Andricus inflator* f. *globuli*, *A. foecundator*, and *A. curvator* f. *collaris* (found on *Quercus robur* and *Q. petraea*). Though identity is not certain, there is an indication of Oak in some quantity in this part of Essex in Pleistocene and post-glacial times and also of gall insects ovipositing in plant tissues well back into the Upper Pleistocene.

1930. Nitto, M., and Tachibana, K. [**Influence of the wind on the dispersion of the Chestnut gall wasp [*Dryocosmos kuriphilus*?].**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 83, 1956 (89–98). 8 refs. [Jap.jap.e.*e.*]

Data from observations of the 1952 and 1953 outbreaks in the Kanto district, and from wind-tunnel experiments, show that the long-distance dispersal of the wasp (scarcely able to fly one metre in calm air) is caused by weak winds stimulating them to fly upwards and by strong winds carrying them to leeward, the general advance being with the northerly winds prevailing in June/July.

1931. **Ants affecting the germination of forest trees.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55*, 1955 (72).

Seed of *Eucalyptus cinerea*, sown in Oct. 1953 on cleared forest areas after spraying with 2% chlordane against Argentine ants, did not germinate for nearly a year owing to drought. Counts made in June 1955 on 2 treated and 2 untreated plots showed 172 seedlings on the treated and none on the untreated.

1932. Fagundes, N. Barcellos, *et al.* Nova forma de aplicação do paradiclorobenzeno no combate à saúva. [**New method of applying *p*-dichlorobenzene in the control of leaf-cutter ants.**] *Boletim fitossanitário, Rio de Janeiro* 6 (1/2), 1952/5 (11–9). [Port.] I.I.E.

A report on experiments carried out by the Division of Plant Hygiene of the Ministry of Agriculture. Complete control was obtained by blowing a powder consisting of 70% *p*-dichlorobenzene, 10% $CaCO_3$ and 20% talc into ant hills (*Atta sexdens rubropilosa*) by means of a hand pump, at rates of 20–25 g./sq. m.

Diptera

See Nos. 1835–6, 1839.

459. Other Animals

See Nos. 1538, 1836.

46. Damage to Tree Growth by Man

See also Nos. 1457, 1588, 1794, 1978.

1933. Herrick, D. E., and Deitschman, G. H. **Effect of tractor logging upon hardwood stands.** *For. Prod. J.* 6 (10), 1956 (403–8). 6 refs.

During improvement fellings in uneven-aged stands in rugged Ozark country, the difference in damage done by tractors of various sizes, apart from the width of skidding trails required, was small. The use of logging arches in log-length logging reduced the number of trees injured per 1000 bd. ft. cut. Tree-length logging caused more frequent and more severe injuries per unit of area disturbed in collecting a load, but with both methods injuries should, with care, affect no more than ca. 10% of the remaining trees. Saplings were damaged more than larger trees.

1934. Krauss, H. H. Die Bedeutung der Waldstreunutzung für den Land- und Forstwirt. [**The significance of litter removal for the farmer and the forester.**] *Dtsch. Landwirtsch.* 7 (9), 1956 (458–62). 15 refs. [G.]

A review, based on literature dating from 1876, of the effects of litter removal on forest soils and tree growth, and of the uses of litter in agriculture.

48. Injuries Due to Unknown or Complex Causes

1935. COPELAND, O. L., JR., and LEAPHART, C. D. **Preliminary report on soil-rootlet relationships to pole blight of Western White Pine.** *Res. Note Intermt. For. Range Exp. Sta.* No. 22, 1955. pp. 6.

First results from a detailed soil and root study of 60- to 80-year stands of *P. monticola* in N. Idaho, based on 11 one-acre plots in lightly, moderately and severely blighted areas plus 6 control (healthy) plots. Correlation analysis showed that the available water-holding capacity of the top 32 in. of soil was inversely related to the % of basal area affected by blight, that the effective soil depth was similarly related, but the relative abundance of rootlets had little influence.

1936. **Mortality in Rata and Kamahi.** *Rep. Dep. sci. industr. Res. N.Z. 1955/56*, 1956 (13).

Large areas of Rata [*Metrosideros robusta*] and Kamahi [*Weinmannia racemosa*] are dying in Westland, causing a serious danger of erosion on the denuded ground. The insect complex on these trees has been examined and a considerable number of species, especially scale insects, were found, but in general there was little difference in population levels between severely damaged and unaffected forests.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

1937. LÜNZMANN, K. Zwei neue forst- und holzwirtschaftliche Rechenscheiben. **[Two new slide-rules for the forest and timber industries [from the Federal Research Institute, Reinbek].]** *Forstarchiv* 26 (7), 1955 (157–60). [G.]

Describes two circular slide-rules (illustrated), with logarithmically divided surfaces. One is devised (*a*) for converting stacked cu.m. to solid cu.m. and (*b*) for converting English and American measurements (cu. ft. or bd. ft.) into cu.m. The second is used to calculate stand volume from the Grundner and Schwappach formula:

$$V = g.h.n.f. \text{ (cu.m./ha.).}$$

1938. BONNEMANN, A. Die Buchungseinheit in der Forsteinrichtung und Forstverwaltung. **[The unit of accountancy in forest management and administration.]** *Forstarchiv* 26 (3), 1955 (49–54). 6 refs. [G.g.]

In German forest accountancy, the measurement unit is the *Erntefestmeter* (solid cu.m. of the felled log, usually under bark). The author proposes that the name '*Holzfestmeter*' should be adopted for u.b. measurements. The conversion factor from the management unit—the *Vorratsfestmeter* (solid cu.m. in the standing tree)—should be estimated for each forest individually, based on the permitted annual cut and actual yield, the conversion factor being largely dependent on site conditions and species.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

See also Nos. 1959–60.

1939. CZARNOWSKI, M. Jak drzewa dostosowują swą grubość w zbiorowiskach. **[How trees adjust their diameter in communities.]** *Problemy, Warszawa* 12 (9), 1956 (627–32). [Pol.] L.P.C.I.

The author deduces from Baader's and Zimmerle's investigations that the mean d.b.h. of a tree grown in conditions of continuous freedom is roughly twice that of a tree which grows constantly crowded by neighbours. The scatter of points on a height/d.b.h. diagram is explained as being caused by different degrees of crowding. The crown ratio is taken as a measure of this crowding and, for Polish even-aged pure Scots Pine stands, the optimum value is given as $\frac{1}{3}$ throughout their life. It is stated that pure even-aged stands growing under identical environmental conditions have, regardless of their age, the same number of trees in an area determined by the mean stand height, i.e., a square whose side is equal to that height; or, putting this generalization in another form: in regular, pure, even-aged stands, the number of trees within a square whose side equals the mean stand height is, for a given site quality, a constant, independent of age. The author's 'index of crowding' z equals 1 when the stand density gives the optimum crown ratio of $\frac{1}{3}$; z will be near zero for (open) stands with trees whose crowns begin near the ground. He puts forward the formula

$$d = aH \frac{2}{z+1} - \Delta,$$

where d is mean d.b.h., H mean height, and a and Δ are constants for a given species and for a given ratio of wood volume to the total space occupied by the stand. Applying this formula to a d.b.h./height/number-of-trees table set up by Weise in 1880, the author obtains calculated d.b.h. values for different stands, which agree very well with the measured values, the S.E. being $\pm$ 3·8%.

1940. MATÉRN, B. **On the geometry of the cross-section of a stem.** *Medd. SkogsforsknInst., Stockh.* 46 (11), 1956. pp. 28. 23 refs. [E.e.sw.] Price *Kr.*2.

A mathematical discussion of the errors arising in estimates of basal area from the fact that cross-sections of stems are not circular, and of the various methods of mensuration commonly used. These include Bitterlich's, which is considered equivalent

to measuring one diameter at random. Among concepts applied are that of 'convex deficit', i.e. the difference between true area and the convex closure, viz. the area enclosed by a tape stretched round a tree, and 'isoperimetric deficit', i.e. the difference that generally exists between this area and a circle of the same perimeter. It was found that all random methods tend to have a positive bias. From the geometrical point of view, girth measurements are preferable to diameter measurements, in which estimates based on the mean of 2 random diameters (there is little practical difference between the use of arithmetic and geometric means) are preferred to those based on maximum or minimum diameters. Further investigations on tree sections so as to gain empirical insight into the relationships involved are recommended. *From author's summary.*

1941. Poleno, Z. Několik poznámek ke svěrkování porostů. [**Some remarks on forest mensuration.**] *Lesn. Práce* 34 (9), 1955 (400–5). [Cz.]

Rounding of log diameter down to the nearest even number of cm. results in an average error of 1 cm. The relative error is expected to be a hyperbolic function of the diameter, and this has been confirmed by measurements of 55,000 trees (38% *Picea abies*, 18% *Pinus sylvestris* and 44% *Fagus sylvatica*) belonging to the 4th, 5th and 6th [20-year] age classes in 60 pure, even-aged stands. It is shown that the relative error caused by rounding the diameters of all the trees in the stand down to the nearest even number of cm. is roughly equal to that for the arithmetical mean stem. When measuring tree volumes on the basis of 2-cm. and 4-cm. d.b.h. gradations, the author has found that, up to the modal d.b.h., the results obtained from 4-cm. steps are lower, whereas beyond the modal value they are higher, than those obtained from 2-cm. steps. The error for 4-cm. steps in roughly 4 times as great as for 2-cm. steps. Since, in accordance with Czechoslovakian instructions, stands must be measured not later than 15 April of the year preceding the felling year, the author calculates the probable volume increment between measurement and felling: it is found to be $< 4{\cdot}1\%$.

1942. Hartong, A. L., and Thornton, P. L. **Bias in timber volume estimates caused by rounding off d.b.h. and merchantable length measurements.** *J. For.* 54 (11), 1956 (769–70).

A study carried out in Iowa on 1462 hardwood trees showed that grouping trees in 2-in. diam. classes caused an over-estimate of 1·19% bd. ft. volume, and grouping logs in 8-ft. lengths an over-estimate of 0·92%. A suggested emendation is to measure d.b.h. to the nearest 0·1 in. and logs to the nearest foot.

522. Height, Length

See also No. 1998.

1943. Stoffels, A., and Nieuwegiessen, J. A. van de. Twee latten in T-vorm als hoogtemeter. [**Two laths in T arrangement used as a hypsometer.**] *Ned. Boschb.-Tijdschr.* 27 (6), 1955 (144–9). [Du.f.]

Theoretical calculations agreed well with practical observations on the extent of the error to be expected in different height classes by observers of different heights. The instrument is simple but of very limited use.

1944. Eič, N. Der modifizierte Baumhöhenmesser Christen. [**A modification of Christen's hypsometer.**] *Schweiz. Z. Forstw.* 107 (12), 1956 (767–8). [G.]

The chief modification is the attaching of a long handle to the instrument by a ball-joint ensuring its perfect verticality and permitting it to be of greater length (here 50 cm.), since it can be used at a greater distance from the eye, with the attendant advantages of larger and more accurate graduation. Accuracies are given as 10–25 cm. up to 25 m., 35–50 cm. up to 40 m., and 50–100 cm. for > 40 m.

1945. Pardé, J. Une notion pleine d'intérêt: la hauteur dominante des peuplements forestiers. [**A useful conception: dominant height of forest stands.**] *Rev. for. franç.* 8 (12), 1956 (850–6). 14 refs. [F.]

Briefly explains the use of 'dominant stand height' (= mean height of dominants) in assessing site quality, marking for thinning etc., and reviews the literature on the subject. [Cf. *F.A.* 17 No. 4297.]

1946. Matsui, Z., and Osanai, T. [**The height curve of coniferous stand.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (133–41). [Jap.jap.e.*e.*]

The height/diameter ratio is influenced by site, stand type and tree class. After calculating constants of least deviation from data on Todo Fir (*Abies mayriana*), equations for height/diameter curves are developed for even-aged, selection, young planted and secondary, and overmature stands, natural coniferous forest and the analysis of a single stem.

523. Bark

See also No. 1961.

1947. Dissescu, R. Proporţia de coajă la molidul din ţara noastră. [**Bark thickness of Spruce in Rumania.**] *Rev. Pădurilor* 70 (9), 1955 (414–7). 6 refs. [Rum.]

Measurements were made on 825 Rumanian-grown Spruce and the results compared with data from the U.S.S.R. Data are given on bark thickness and volume in relation to tree diameter and volume. Russian Spruce has thicker bark than Rumanian.

1948. Maezawa, K. **Bark thickness at several heights in young Douglas-Fir trees.** *Res. Note U.B.C. For. Club* No. 13, 1956. pp. 3 + 1 gph. 1 ref.

Based on measurement of 40 trees (age 50–80; d.b.h. 5·8–27·8 in.; site index at 100 years, 80–160 ft.). Data obtained agreed with the regressions of Johnson for bark-thickness over d.b.h. [cf. *F.A.* 16 No. 4367], but separate estimates were found necessary for bark thickness at other heights: these relations are illustrated graphically and by equations.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also No. 1955.

1949. MATSUI, Z., OSANAI, T., and BABA, K. **[The taper table of Todo Fir [*Abies mayriana*] stem.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (142–8). [Jap.jap.e.e.]

Gives a table showing diameters at 1, 3, 5 m. etc. from the ground, for total heights from 10 to 35 m. and d.b.h. from 14 to 64 cm., based on measurement of 4515 stems.

1950. SANTOS, H. J. ABRANTES DOS. Relação entre o d.a.p. e o diâmetro do tronco junto ao solo na *Cryptomeria japonica* Don na Ilha de S. Miguel, Açores. **[Relationship between d.b.h. and diameter at the base of the stem in *C. japonica* on the island of St. Michael, Azores.]** *Estud. Inform. Serv. flor. aqüíc. Portugal* No. 67-*E*3, 1956. pp. 5. [Port.] Limited distribution.

Data from 384 trees of 4–66 cm. d.b.h. in stands of varying site class, give the following regression coefficient:

$$x_1 = 0{\cdot}754\, x_2 + 1{\cdot}293$$

where x_1 = d.b.h. and x_2 diameter at the stem base.

1951. GIURGIU, V. Corelaţia dintre indicii de formă q_2 şi q_5 la molid şi folosirea ei la determinarea volumului arborilor in picioare. **[The correlation between the form quotients q_2 and q_5 of *Picea abies* and its use in calculating the volume of standing trees.]** *Rev. Pădurilor* 70 (7), 1955 (322–8). [Rum.]

Gives tables: (*a*) showing correlation coefficients between the form quotients d.b.h./mid-ht. diam. (q_2) and d.b.h./diam. at 5 m. (q_5); and (*b*) for determining q_2 as a function of q_5 and of h (total height) to an accuracy of $\pm$ 3%. The use of q_2 in calculating the volume of standing trees is explained. [Cf. *F.A.* 17 No. 687.]

1952. JENSEN, C. E., and WOERHEIDE, J. D. **Pin Oak form class.** *Sta. Note Cent. St. For. Exp. Sta.* No. 97, 1956. pp. 2.

Form classes for *Quercus palustris* on poorly drained bottomland and upland sites in the S. Illinois-Missouri area were computed as follows:

$$\text{form class} = \frac{\text{diam. u.b. at 17 ft.}}{\text{diam. o.b. at } 4\tfrac{1}{2} \text{ ft.}} \times 100.$$

The data, from measurements on a total of 632 trees, are tabulated.

524.3. Volume of Tree Groups and Stands

See also Nos. 1937, 1941–2, 1961.

1953. JEFFERS, J. N. R., and GAVRIELIDES, C. **Volume tables for *Eucalyptus camaldulensis* [*rostrata*] in Cyprus.** *Tech. Pamphl. For. Dep. Cyprus* No. 23, 1956. pp. 4 + 3 tbls.

Includes tables, based on measurement of 614 trees, giving volume o.b. in cu. ft. to a top diam. of 3 in. for girths 7–76 in.

1954. KUBITA, S., and ROUPEC, J. Zjišťování hmoty topolů na stojatě. **[Assessment of the volume of standing Poplar trees.]** *Lesn. Práce* 35 (1), 1956 (21–7). [Cz.]

No volume tables for Poplar being yet available in Czechoslovakia, the Schwappach tables for Oak are adopted. On the basis of measurements made in 1952–53 by Kopriva and Roupec on 1165 Poplar stems by the Huber method, the authors found that the arithmetic mean deviation of the volume found in Oak tables from that actually measured was + 22·86%, varying relatively little within the d.b.h. range 10–70 cm. It can be assumed in the first approximation that the volume of Poplar wood > 7 cm. diam. at the smaller end, $V_p = kV_o + C$, where V_o is the analogous volume of Oak and k and C are constants. However, the correlation between V_p and V_o is not linear and the scatter is too great; it is therefore wrong to use Oak tables for Poplar, and Poplar volume tables ought to be prepared as a matter of urgency.

1955. PETRESCU, L. Forma şi volumul plopilor negri hibrizi. **[Form and volume of hybrid Black Poplars.]** *Rev. Pădurilor* 70 (10), 1955 (443–8). 9 refs. [Rum.russ.]

On the basis of measurements of 1283 trees of × *Populus regenerata*, × *P. marilandica* and × *P. serotina*, the author constructs a volume table and a table of form factors, and compares these with Rumanian figures for *P. alba* and *P. tremula*.

1956. DORIN, T. Tabele de cubaj la salcia căprească. **[Volume tables for Goat Willows.]** *Rev. Pădurilor* 71 (2), 1956 (111–2). 2 refs. [Rum.]

The tables give stem volume, total volume, and branchwood (in % of total volume) for *Salix caprea*, *S. silesiaca* and *S. subcaprea* between 4 and 26 cm. diameter and 6 to 20 m. total height.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

1957. LOETSCH, F. **Report to the Government of Thailand on inventory methods for tropical forests. Part 2, technical appendices.** *Expanded Technical Assistance Program, FAO Report* No. 545, 1956. pp. 19 + 39 dgms.

1958. HÄBERLE, S. Die Holzvorratsinventur mit Repräsentativverfahren. **[Growing-stock inventories by sampling methods.]** Arbeitskreis für forstliche Biometrie, Freiburg. 1955. pp. 50. 24 refs. [G.g.]

The author discusses the application of various sampling methods (including Bitterlich's) particularly in connexion with aerial photography, and analyses the practical and theoretical sources of error in enumeration sampling and in the evaluation of aerial photographs. Size and distribution of sample plots, methods of delimitation, stratification, and computations of fiducial probabilities and sampling intensities are also dealt with. Data from sample surveys in German forests, including some in multi-storeyed and uneven-aged, mixed stands, are compared with full enumerations and shown to fall within acceptible limits. Where plots of only 0·02 ha. arranged on lines had been used, results were less accurate than for plots of 0·1 ha. arranged on a grid, and proved inadequate for estimates of species composition and diameter distribution. The required sampling intensities for a 5% and 10%

fiducial limit in the investigated stands is computed, and tentative graphs of such intensities are constructed for selection and single-storeyed mixed forest; also a table comparing times (and hence costs) for sampling at the required intensity, with costs of full enumerations.

1959. Deitschman, G. H. **Plotless timber cruising tested in upland hardwoods.** *J. For.* 54 (12), 1956 (844–5). 1 ref.

[Cf. *F.A.* 13 No. 3197.] Preliminary trials of the variable-plot method, using the angle-gauge instrument, were carried out over ca. 30 acres in S. Illinois in 1955. A comparison with the results of a 100% cruise showed results to be inaccurate; the b.a. of small poles was consistently overestimated by 50% and large poles and sawtimber underestimated by 20%. Lack of experience with the instrument may account for some of the error. Greater efficiency could be achieved by a 2-man crew, one man using the angle-gauge and recording data, the other checking size-class, cull and defects by visiting doubtful trees.

1960. Güde, H. Anleitung zur Aufnahme von Bitterlich-proben. **[A guide to sampling by Bitterlich's method.]** *Allg. Forstztg.* 66 (23/24), 1955 (306–8). 11 refs. [G.]

Gives suggestions for rule-of-thumb methods of determining proper sampling intensity, spacing of sampling points, working procedure, and the determination of basal area, mean stem, mean height, and volume/ha. (the latter by sample measurements combined with existing volume tables, and graphs), error computations, and the avoidance of systematic errors, and works out a complete example.

525. Volume by Assortments. Merchantable Volume

See also Nos. 1660, 1942, 2248.

1961. Mathauda, G. S., and Singh, M. M. **General volume and bark outturn tables for Babul (*Acacia arabica*, Willd.).** *Indian For. Rec.* (*n.s.*) *Silviculture* 10 (1), 1956. pp. 17 + 3 gphs.

Based on measurement of 1183 trees. Tables give: standard stem-timber volumes by 2-, 4-, 6- and 12-in. girth classes; length of standard timber bole by 2- and 4-in. diam. classes; standard total timber plus smallwood volumes by 2-, 4-, 6- and 12-in. girth classes; outturn of bark (at 12% m.c.) by the same girth classes; double bark thickness of logs by 2-in. and 6-in. girth classes; and a girth/diameter conversion table.

1962. Skinner, E. C. **Log position volume tables for western conifers.** Pacific Northwest Forest and Range Experiment Station, Portland, Ore. 1955. pp. 55. 3 refs.

Based on the Girard and Bruce form-class volume tables for 16-ft. logs.

1963. Ralston, R. A. **The break-even point for rough 8-foot bolts merchantable as sawlogs or cordwood.** *Tech. Note Lake St. For. Exp. Sta.* No. 469, 1956. pp. 2.

Presents a table giving the break-even top u.b. diameters of 8-ft. bolts for various ratios of sawlog/pulpwood prices by 3 log rules.

1964. Kimmey, J. W. **Cull factors for Sitka Spruce, Western Hemlock and Western Red Cedar in southeast Alaska.** *Sta. Pap. Alaska For. Res. Cent.* No. 6, 1956. pp. 31.

Cull was studied in *Picea sitchensis* and *Tsuga heterophylla* (some 230 trees each) and *Thuja plicata* (98 trees). Tables show cull discount factors, based on bd. ft. and cu. ft. volumes, for each species, for trees of different diameter, and similar discount factors for use when certain cull indicators are present. These indicators are listed for the different species and some are illustrated. Further tables show % cull by altitude, and tree diameter, volume and cull by age class.

526. Log Measurement. Scaling

See No. 1942.

527. Solid Volume of Stacked Products (including Converting Factors)

See also No. 1937.

1965. Taras, M. A. **Weight-volume relationship of cordwood.** *For. Fmr.* 16 (1), 1956 (10–2, 18).

Discusses the merits of selling pulpwood by weight instead of by volume, with tables giving data on actual and calculated cordwood weights, and weights for various species in the south-east U.S.A., including *Pinus taeda*, *P. palustris*, *P. echinata* and *P. elliottii*.

1966. Gevorkiantz, S. R. **Short cuts in scaling —converting stacked cordwood to board feet.** *Tech. Note Lake St. For. Exp. Sta.* No. 468, 1956. pp. 1.

A method for estimating the bd. ft. scale of stacked 8-ft. bolts $\leq$ 6 in. in diam. The number of bolts, length, and height of a cord are determined and the gross bd.ft. scale is then found from the table given. The note is a revision of No. 182.

1967. Johnson, E. W. **Photographic determination of pulpwood volume in rick-piled storage yards.** *Bull. Ala. agric. Exp. Sta.* No. 299, 1956. pp. 51. 65 refs.

A study was made of several techniques: (*a*) the use of terrestrial horizontal photographs taken with a photo-theodolite or camera-transit from fixed towers, and analysed by standard graphical and mathematical methods; (*b*) the use of aerial oblique photographs, also analysed by standard mathematical methods; (*c*) the use of large-scale conventional vertical aerial photographs analysed by (i) simple parallax measuring instruments such as the parallax bar or stereocomparator, (ii) precise plotting equipment, such as the Multiplex; (*d*) large-scale vertical aerial photographs taken with cameras designed to eliminate image motion, analysed by special methods designed for use with such photography; (*e*) the use of radar profiling equipment. The various methods are described in detail. It is concluded that (*a*), in spite of the high initial cost of equipment, is economical in labour, gives accurate

results, involves no complicated or difficult measurements or computations, and is altogether the most practical method.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 1603–4, 1939, 1994.

1968. MEYER, H. Über Zusammenhänge zwischen Assimilationsmasse und Holzzuwachs in Fichtenbeständen. **[The interrelation of assimilation substance and timber increment in Spruce stands.]** *Arch. Forstw.* 5 (1/2), 1956 (1–7). 8 refs. [G.]

Discusses the definitions and criteria used by 8 workers in correlating assimilation and increment [cf. *F.A.* 15 No. 1657]. The determination of leaf area or the dry weight of needles (the best criteria) is impracticable for whole stands (time and cost for stripping needles are quoted). In a search for more convenient criteria, samples were examined of 296 felled, 20- to 40-year Spruce from 5 pure stands on 4 site qualities and at different altitudes. The following mean correlation equivalents were established: between (1) weight of needle-bearing twigs and (2) green crown length, 0·790; between (1) and (3) crown area (i.e. crown length × mean diam. of crown projection), 0·783; between (1) and (4) diam. increment, 0·739; between (3) and (4), 0·721. Measurements on five 42-year Spruce have shown that the ratio of fresh needle weight to the combined weight of needles and the twigs bearing them was 71 ± 1·8%. That a steady ratio of these variables cannot be greatly departed from is shown in the present study by the close correlation between (1) and (3) on the one hand and both (1) and (3) with (4) on the other. Tables show these correlations and their standard deviations for each of the 5 stands. Two ways of weighting the crown area with crown density (number of green whorls per metre) did not improve the correlations.

54. Assessment of Site Quality

See also Nos. 1945, 1978, 1982.

1969. COPELAND, O. L., JR. **Preliminary soil-site studies in the Western White Pine type.** *Res. Note Intermt. For. Range Exp. Sta.* No. 33, 1956. pp. 4.

A study was made on the Potlatch Forests, Idaho, to estimate site class from soil characteristics for *Pinus monticola* and associated species. Site class on 29 plots of 60- to 80-year *P. monticola* was determined by taking the average height of dominant and co-dominant trees as stand height and the age of the oldest tree as stand age. Soil measurements were taken and statistical correlations established between site class and the available water-holding capacity of the top 3 ft., the effective depth, and depth to the zone of greatly reduced permeability. Effective depth, determined from field observation, gave the lowest mean deviation (6·4 ft.) from the actual site class. Site classes of *Larix occidentalis*, *Pseudotsuga taxifolia* and *Abies grandis* were also determined on 12–18 plots each and found to be significantly correlated with those of *P. monticola*.

1970. GEVORKIANTZ, S. R. **Site index curves for Balsam Fir in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 465, 1956. pp. 2.

1971. GEVORKIANTZ, S. R. **Site index curves for Jack Pine in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 463, 1956. pp. 2. 1 ref.

1972. GEVORKIANTZ, S. R. **Site index curves for Aspen in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 464, 1956. pp. 2. 1 ref.

1973. STOECKELER, J. H. **Soil factors affecting the growth of Quaking Aspen forests in the Lake States.** Abstr. of thesis, University of Minnesota, St. Paul, Minn. 1956. pp. 3.

Soils on 104 plots of *Populus tremuloides* were classified in the field, soils from 70 plots were analysed in the laboratory, and the major factors affecting site index (s.i.) and growth were isolated. The s.i. ranged from 44 to 83 ft. (at 50 years). Relations between s.i. and various soil characteristics were analysed statistically. Relations between s.i. and mechanical properties (e.g. silt plus clay content, moisture equivalent) were generally significant at the 1% and invariably at the 5% level, while some of those between s.i. and specific chemical properties (e.g. N or Ca content, pH) were significant, usually at the 5% level, and others non-significant. On droughty sands s.i. was ⩽ 55, on better sandy loams ca. 70 and on silt loams 75–80. The main factors affecting the relation of s.i. to texture were: depth of water-table; repeated burns; drainage and aeration; water capacity of underlying soils (under sand); and presence of underlying coarse gravel (under loams and sandy loams). Chemical tests showed a markedly higher content of Ca, Mg and, to some extent, K, on good sites; the greater longevity, higher m.a.i. and lower incidence of heart rot in grey wooded soils of N. Minnesota compared with the lime-poor drifts of N. Wisconsin may be related to the amount of these nutrients. The amount of annual litter fall and content of available nutrients in organic layers of Aspen soils are discussed. Rooting depth ranged generally from 39 to 60 in., maximum 85 in. A close relation was found between nutrient content of soil and the silt plus clay content.

1974. TRIMBLE, G. R., JR., and WEITZMAN, S. **Site index studies of upland Oaks in the Northern Appalachians.** *For. Sci.* 2 (3), 1956 (162–73). 9 refs.

The study covers *Quercus rubra* and 4 other *Quercus* species. Seventy-one even-aged plots 30–150 years old were measured. The effects of the following factors on the site index, Y, are discussed: X_1 aspect, X_2 distance from ridge, X_3 slope, and X_4 total depth of soil. For X_1, N. and E. have higher Y, which increases also with X_2 and X_4, but decreases with increase of slope. To obtain a regression between independent variables and site index, Y is expressed as $\log_{10}$ site index; X_1 as sine (of the azimuth from S.E.) + 1; X_2 as the % distance from ridge to stream; X_3 as % slope; and X_4 as the reciprocal of soil depth (ft.). The equation is then: $Y = 1{\cdot}9702 - 0{\cdot}0618X_1 + 0{\cdot}0012X_2 - 0{\cdot}0020X_3$

$-0{\cdot}1509X_4$. The correlation coefficient is 0·8683, significant at 1%, and the standard error, 9% at a mean index of 66 ft.

A table shows the ratios of the site indexes of the 4 other Oaks to that of the Red Oak. Other factors and indicators affecting site index (ridge tops, soil texture and stone content, drainage, exposure, density of crop, elevation etc.) are discussed. Length of clear bole and ground vegetation provide only rough guides.

1975. DAGNELIE, P. Recherches sur la productivité des hêtraies d'Ardenne en relation avec les types phytosociologiques et les facteurs écologiques. Première partie. Recherche d'un critère de station utilisable dans les hêtraies d'Ardenne. [**The productive capacity of Beech forests in the Ardennes related to types of plant association and ecological factors. Part I. Attempt to find a site-quality criterion suitable for the Ardennes Beech forests.**] *Bull. Inst. agron. Gembloux* 24 (3), 1956 (249–84). 92 refs. [F.f.] E.M.B.

Considers various established methods of judging site quality and compares methods based on study of the growing stock with those based on ecological factors. Since data on increment and yield from the Ardennes Beech forest are insufficient for the purposes of this investigation, it is proposed to use yield tables drawn up elsewhere for stands growing under comparable conditions. A site-index criterion based on heights of stands will be used for purposes of adapting the yield tables for use in the Ardennes.

1976. WECK, J. Über die Grössenordnung der Substanzerzeugung in Baumbeständen verschiedener Vegetationsgebiete. [**Dry-matter production in forests of different vegetation zones.**] *Allg. Forst- u. Jagdztg.* 127 (4), 1956 (76–80). 8 refs. [G.]

A comparison, based on literature, between total assimilation products and the quantities of wood that can be, and habitually are, harvested per ha. and per year in tropical rain forests, monsoon forests, and moist savannas, Central European forests and boreal heath forests.

56. Increment. Development and Structure of Stands

See also Nos. 1239, 1444–6, 1450, 1452, 1467 *et seq.*, 1572, 1582, 1593–4, 1600 *et seq.*, 1968, 1976, 2002, 2004–5.

1977. GRANDJEAN, A. J., SOEST, J. VAN, and STOFFELS, A. Groei van groveden in Engeland en Nederland. [**Growth of Scots Pine in England and the Netherlands.**] *Ned. Boschb.-Tijdschr.* 28 (12), 1956 (273–84). 5 refs. [Du.e.]

Discusses a visit to Scots Pine stands in the New Forest, Bramshill Forest, and the Forest of Dean. Compares yield tables for the two countries, and discusses causes of inferior growth in the Netherlands, and the possibility of introducing Scots Pine seed from the south of England.

1978. MITSCHERLICH, G. Untersuchung über das Wachstum der Kiefer in Baden. 1. Teil: Das Wachstum der Kiefer ohne Berücksichtigung von Zwischen- und Unterstand. 2. Teil: Die Streunutzungs- und Düngungsversuche. 3. Teil: Unterstand und Wertleistung. [**The growth of Pine in Baden. Part 1: The growth of Pine, without regard to admixtures and lower storeys. Part 2. Litter removal and fertilizer trials. Part 3: Understorey and value increment.**] *Allg. Forst- u. Jagdztg.* 126 (7; 10), 1955 (125–50; 193–204); 127 (5/6), 1956 (106–17). 90 refs. [G.g.e.]

Part I reports on investigations in > 50 trial plots, dating in many cases from the 1880's, but not all still extant, in the E. and N. Schwarzwald, the Odenwald, the Rhine valley and the Bodensee areas, and covering stands of varying ages, frequently underplanted or mixed with Spruce, Silver Fir, and/or Beech. The differences due to provenance are discussed, and growth data compared with yield tables in general local use. Height growth up to 30–40 years was greater, and after that age less, than in Zimmerle's tables, particularly in the Rhine valley, a fact that complicated comparisons as it affects site class, and various methods of 'static' or 'dynamic' site-class determination are discussed. Basal-area increment was generally greater, c.a.i. about equal, and m.a.i. greater than the table values. The effect of thinnings on b.a. and volume increment is analysed. The decline in both with heavy thinnings was small, though greater than in Hesse, and much less marked than in Prussia or Sweden. Climatic differences are suggested. Part II reports on litter-removal trials of 20–30 years' duration on a good site, showing declines in increment (persisting for a considerable time after litter removal had ceased) of 15 to 20% on raked plots, and on amelioration trials in the Rhine Valley and in the E. Schwarzwald. On the Rhine, the addition of N increased increments for ca. 5 years, but there was no reaction to liming or the manipulation of soil cover. In the Schwarzwald, on lime-deficient, acid, sandy soil subject to periodical waterlogging, stocked with Pine and Spruce of ca. 90 years, draining, removal of raw humus and ground vetetation, with or without liming, and underplanting with broadleaved trees had no significant effect on the c.a.i. of Pine, but increment borings on Spruce showed a delayed increase 7 years after liming, and an unfavourable reaction to the removal of ground surface layers. Part III analyses c.a.i. and m.a.i. for some of the mixed stands, in terms of volume and value. The development of the understorey frequently offsets the decline of increment in the main Pine crop, and longer rotations would often seem profitable. The tendency, observed in many such stands, to develop into uniform mixed stands should not be interfered with.

1979. IACOVLEV, A. Rapiditatea creşterii speciilor forestiere. [**Rate of growth of forest trees.**] *Rev. Pădurilor* 70 (10), 1955 (437–42). 3 refs. [Rum.]

Tabulates and discusses data on comparative growth, for 3 site classes in Rumania, of *Quercus robur*, *Q. sessiliflora*, *Q. cerris*, *Q. frainetto*, *Fagus sylvatica*, *Picea abies*, *Salix* spp., *Carpinus betulus* and *Tilia* sp., at 30, 60, 90, and 120 years.

1980. PETRESCU, L., and DISSESCU, R. Studiu preliminar asupra producţiei şi productivităţii arboretelor de plopi negri hibrizi. [**Preliminary**

studies on the yield and productivity of hybrid Black Poplar stands.] *Rev. Pădurilor* 70 (7), 1955 (315–20). 7 refs. [Rum.]

Gives tabulated data, by age classes (3–32), for Poplar (× *P. regenerata*, × *P. robusta*, × *P. marilandica* and × *P. serotina*) stands in the floodplain of the lower Danube. Data include mean d.b.h., mean height, number of trees/ha., volume/ha., and m.a.i. in cu.m./ha. as well as minimum and maximum d.b.h., all derived from 56 sample plots.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 1395–6, 2370.

1981. SETH, S. K. **Calculation of diameter increment from successive inventories.** *Indian For.* 82 (11), 1956 (547–52). 2 refs.

Describes a simplified method of tabulating data from successive inventories, which obviates the inaccuracies arising from trees 'jumping' a diameter class between inventories. Instead of calculating 'trees rising' and 'trees stationary', the difference between the two inventories is cumulated with regard to sign (positive or negative) and this leads directly to 'trees rising'. An example is worked out.

1982. BRISCOE, C. B. **Diameter growth of selected bottomland hardwoods as affected by species and site.** *LSU For. Notes La. agric. Exp. Sta.* No. 5, 1955. pp. 2.

Ten-year radial growth at breast height for 160 dominants was determined by increment borings of *Ulmus americana, Celtis laevigata, Fraxinus pennsylvanica, Quercus michauxii, Q. falcata, Q. nuttallii* and *Q. nigra* growing on (1) ridges, (2) flats, and (3) 'sloughs'. Results are tabulated separately for (1), (2) and (3).

1983. HØEG, O. A. Årringsundersøkelser og dendrokronologi i Norge. [**Annual ring research and dendrochronology in Norway.**] *Repr.* from *Blyttia, Oslo* 14, 1956 (41–62). 34 refs. [Nor.e.] [Cf. *F.A.* 17 No. 4319.]

1984. SCHULMAN, E. **Dendroclimatic changes in semiarid America.** University of Arizona Press, Tucson, Arizona. 1956. pp. 142. 93 + 12 refs.

Regional indices, based on measurement of > 300,000 annual rings in selected, drought-sensitive trees from semi-arid sites, are believed to represent, to a fair approximation, fluctuations in rainfall in the upper basins of all the major streams of the western U.S.A. for ca. 500 years. The discovery during 1952–53 of what appears to be a general category of high-altitude, yet drought-sensitive Pines (*Pinus aristata* and *P. flexilis*) in the 2000+ year age-class opens up the possibility of a considerable advance in the understanding of climatic change in the West during the past two millennia. A sampling survey of drought conifers in the Patagonian Andes has shown that *Libocedrus chilensis* is particularly useful as a source of chronology and has led to the development of a 378-year index for this region. Data from all these investigations are set out in tables and graphs, and some aspects of fundamental studies in dendrochronology are discussed.

1985. PRIMAULT, B. Contribution à l'étude de l'influence des éléments météorologiques sur l'accroissement des forêts. [**The influence of meteorological factors on forest increment.**] *Geofisica Pura e Applicata, Milano* 24, 1953 (149–206). 79 refs. [F.f.g.e.] L.S.

A study suggested by the decline in increment noted in many Swiss forests during the last management period, comparing the relative ring widths in Spruce from 5 stands on comparable sites (1 on the eastern plateau, 2 in the foothills near Lake Sarnen, and 2 in the Engadine), with meteorological data (length of growing season, temperatures and precipitation for each season, including the previous autumn) over a period of 25 years. The methods, the underlying assumptions and concepts, and the results, are discussed with reference to the literature but without statistical analyses of the data, and caution in formulating general theories, e.g. on tree chronology, is enjoined. In general, precipitation appeared to be the chief determining factor only in the drier places, spring temperatures having most influence in the cool, humid foothills. The influence of precipitation appears to decline with altitude. Heavy precipitations in the preceding autumn tend to retard growth. [Cf. *F.A.* 17 No. 3126.]

1986. DAWKINS, H. C. **Rapid detection of aberrant girth increment of rain-forest trees.** *Emp. For. Rev.* 35 (4), 1956 (449–54). 1 ref.

The difficulty of obtaining precise girth measurements on large rain-forest trees led to a series of experiments in Mpanga Research Forest, Uganda, which have shown that accurate measurement is both possible and profitable provided that the degree of 'replication in time' is sufficient. Use is made of steel tapes calibrated in $\frac{1}{10}$ in. and held flush against very carefully marked above-buttress paint rings just wider than the tape itself. Each measurement consists of the best of three readings (i.e. at least two concurrences) made after twice loosening and retightening the tape on the paint ring, and the result is recorded to the nearest $\frac{1}{10}$ in. Great discrepancies in growth rate were found between neighbouring trees of the same species, crown position and apparent vigour. In order to control a more accurate system of measurement, capable of detecting much smaller changes, and involving no costly apparatus, the ten-ring method was evolved. It consists in painting parallel rings on each tree, the spacing between them being of no importance provided there is at least 1 in. difference in girth between the largest and smallest. Each measurement then consists of a routine best-of-three reading at each ring, the mean of the ten then being expressed in $\frac{1}{100}$s of an inch. Provided that the usual skilled operator does the measurements, the mean girth obtained is likely to be within ± 0·03 in. of the truth.

With the completion of a year's weekly measurements on 5 trees each of *Lovoa brownii* and *Entandrophragma angolense*, it is concluded that the method is highly efficient and simple. The cost is almost

entirely a matter of man-hours: in practice it was not possible to measure more than 200 rings (i.e. 20 trees) in a day. Girth fluctuations proved greater than expected: it is possible for a tree of 5 ft. girth to contract 0·1 in. in a week and 0·4 in. in 10 weeks. Girth increment is often strongly correlated with rainfall, provided that the tree is in full leaf and not flowering. In the case of *L. brownii* the correlation is so marked that the year is sharply divided into an inert and an active period, the former corresponding to the period of leaf-fall and subsequent flowering. The data also bear out conclusions from other plots, that crown position and apparent vigour are not reliable guides to behaviour. It is proposed to use this method of measurement to determine the effect on girth increment of two methods freeing trees from competition by (1) clearing all vegetation within a 30-ft. radius, and (2) killing all adjacent crowns until the subject tree's crown is 'emergent', leaving the understorey and ground layers untouched.

1987. Schober, R. **On the seasonal course of secondary growth in thickness.** Forest Products Research Laboratory, Princes Risborough. [1956]. pp. 6 + [3]. 4 refs. Abridged translation by E. W. J. Phillips from *Allg. Forst- u. Jagdztg.* 122 (3), 1951 (81–96). [See *F.A.* 14 No. 1429.] Limited distribution.

566. Yield Tables and Their Construction

See also No. 1560.

1988. Grandjean, A. J., and Stoffels, A. Opbrengsttabellen voor de groveden in Nederland. **[Yield tables for Scots Pine in the Netherlands [: their construction and use].]** *Ned. Boschb.-Tijdschr.* 27 (9), 1955 (215–31). 22 refs. [Du.f.e.]

1989. Matsui, Z., and Shinohara, H. **[Growth of Guimatsu-Larch [*Larix dahurica*] and Karamatsu-Larch [*L. leptolepis*] planting stand.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (174–92). 9 refs. [Jap.jap.e.*e.*]

Gives climatic and comparative growth data for plantations of the two species in 3 areas of Hokkaido, with preliminary yield tables for each. For (*a*) *L. dahurica*, these cover 50, and for (*b*) *L. leptolepis*, 30–40 years' growth. At 25 years (*a*) is inferior to (*b*) in height and volume m.a.i. by 4–32% and 30% respectively. For (*a*) the m.a.i. of the main crop is 4·9–5·5, and of main crop plus thinnings, 5·8–7·0 cu.m./ha. Though of slower growth, shorter bole, greater taper and having large knots, it is much planted since it grows naturally in moist bogs and peat-moss and on steep, coarse-gravel slopes and is more resistant to frost, ice, and rat damage.

1990. Matsui, Z., and Onodera, S. **[The composition and growth of the secondary stand on the burnt-over land in Kitayubetsu district.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (193–216). 6 refs. [Jap.jap.e.*e.*]

Yield tables are presented for Yamanarashi [*Populus sieboldii*], Shirakaba [*Betula japonica*] and Makaba [*Betula* sp.] stands in which these species are the dominant colonizers of 45-year-old burns, involving nearly 10,000 ha. in Hokkaido. The m.a.i. (main crop) at 35 years of the Poplar is 6·0, 5·2 and 4·4 cu.m./ha. (3 sites); for the Shirakaba 5·9; and for the Makaba 4·9 and 3·6 (2 sites). Supporting data (stand tables, stem analyses, regressions) are given in 21 tables: one of these gives the annual area (ha.) burnt in Hokkaido from 1904 to 1945.

1991. Matsui, Z., and Matsuzaki, S. **[The multiple management of Basswood stand.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (166–73). 4 refs. [Jap.jap.e.*e.*]

Gives growth data and a yield table for *Tilia japonica*, for stands of 5–50 years, showing a m.a.i. of 4·7 cu.m./ha. Useful as bee pasture (yield data given), with straight stems, and used for veneer, packaging, furniture and implements, the species warrants expenditure in planting both on farms and in forest stands.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also No. 1447.

1992. Coulon, M. de. Les gros arbres de la forêt des Joux. **[The big trees of the forest of Joux.]** *Forêt, Neuchâtel* 10 (2), 1956 (33–8). [F.]

A yield study in an uneven-aged mixed forest of Silver Fir and hardwoods in the high Jura, managed since 1902 by the *méthode du contrôle*, showing development of growing stock and increment in diameter, volume, and value by diameter classes or groups. Diameter increment varied little between 20 and 100 cm., and volume increment was greatest in the highest diameter class. Value increment estimated on the basis of an analysis of sales, culminated at 70 cm. diam., but subsequent decline (due to the greater incidence of rot etc.) was small, and the author deprecates cutting these large trees prematurely.

1993. Susmel, L. Caratteri comparati delle abetine primarie delle alpi dinariche e delle abetine secondarie delle alpi orientali italiane. **[Comparative characters of the primary Fir/Spruce/Beech forests of the Dinaric Alps and the secondary Fir/Spruce/Beech of the Eastern Italian Alps.]** *Repr.* from *Ann. Accad. ital. Sci. for.* 5, 1956. pp. 32 + 12 plates. [It.f.] [Cf. *F.A.* 18 Nos. 776, 800.]

1994. Alvarez, M. Vilas, and Bentes, J. I. Fernandes. Subsidios para a determinação da composição normal dos povoamentos inequiénios de sobreiro. **[Estimation of the normal constitution of uneven-aged Cork Oak stands.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 68-*D*3, 1956. pp. 10 + 1 tbl., 3 gphs. 10 refs. [Port.port.] Limited distribution.

Having established a correlation between g.b.h. and the diameter of the horizontal projection of the crown in each girth class, the authors calculate the normal constitution for the uneven-aged stands situated S. of the Tagus.

58. Surveying and Mapping. Aerial Surveys

See also Nos. 1656, 2020, 2317.

1995. HILDEBRANDT, G. Der Stand der forstlichen Luftbildauswertung für die Forsteinrichtung und Forstvermessung. **[The present position of aerial photo interpretation for management and mensuration.]** *Arch. Forstw.* 5 (1/2), 1956 (126–52). 56 refs. [G.]

A review of the literature (56 references), chiefly from the European standpoint, with special reference to the Russian, but drawing also on N. American material. Photogrammetry, topography, evaluation, enumeration, site-mapping and planning are covered. Details of contracts with private firms and time requirements are included.

1996. LOETSCH, F. Waldflächeninventur im Kleinprivatwald mit Stichprobenverfahren unter weitgehender Benutzung des Luftbildes. **[Inventory of forest area in small private forests by random sampling, making extensive use of aerial photographs.]** *Forstarchiv* 26 (8), 1955 (173–82). 6 refs. [G.g.]

A survey was made of the Prüm district, whose total area of ca. 92,000 ha. contains 20,000–25,000 ha. of small private forests (ca. 6000 owners, some owning several scattered lots), to determine the area occupied by 4 main categories—waste land, to be afforested or used agriculturally, understocked areas, coppice and high forest, coniferous and broadleaved. The line-intercept method was applied, using squares of 1 sq. km. instead of a continuous line. Every 4th grid square was marked off on an aerial photograph (scale 1/10,000). The categories were delimited round the sides of the square and measured. Assuming length to be proportional to area, the total area of each was calculated. Aerial photos were used (*a*) to help the surveyor locate the sample plots and (*b*) as a check on category boundaries; for the 243 plots the S.E. was calculated to be $\pm$ 6%. The theoretical basis for these computations is discussed. Tables show the results of the inventory at the 95% fiducial level. This method of surveying by random sampling is particularly recommended for such regions, where full inventories would be too costly.

1997. MOESSNER, K. E. **Combined vertical and horizontal stereograms.** *Res. Note Intermt. For. Range Exp. Sta.* No. 36, 1956. pp. 3.

Describes the preparation of stereograms combining vertical aerial views with horizontal pairs taken by a stereo camera, and so helping the interpreter to visualize ground conditions.

1998. MOESSNER, K. E. **The accuracy of stand height measurements on aerial photos in the Rocky Mountains.** *Res. Note Intermt. For. Range Exp. Sta.* No. 25, 1955. pp. 5. 3 refs.

[Cf. *F.A.* 12 No. 834.] Aerial-photo measurements were compared with field measurements of stand height on 68 forest inventory plots of mixed conifers in S. Idaho, the stands being well distributed through a range of ca. 20–90 ft. in height. Mean height was determined on each $\frac{1}{5}$-acre plot by Abney level readings and compared with measurements on photos made with pocket stereoscope and parallax wedge. The S.E. for 24 plots was $\pm$ 10·7 ft. on 1/20,000 scale photos (S.D.'s of field measurements for the same plots averaged 7 ft.); the S.E. was least for the 1/28,000 scale photos, at 5·1 ft. (correlation coefficient = 0·94). Precise measurements can be made in this mountain region from aerial photos if corrections are made for differences in ground elevation.

1999. WASHBURN, R. I. **Electronic recorder as aid in aerial insect surveys.** *Res. Note Intermt. For. Range Exp. Sta.* No. 31, 1956. pp. 3.

To record data while in flight, an electronic dictaphone was set up in the plane. A box of 6-volt batteries was used to connect through a motorcar dashboard electric cigar-lighter with the converter furnishing voltage to the dictaphone.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 1994, 2008.

2000. ABETZ, K. Zur Weiterentwicklung der Forsteinrichtung. **[Development trends in forest management.]** *Allg. Forst- u. Jagdztg.* 127 (1), 1956 (1–8). [G.e.]

A lecture surveying the merits of traditional and suggested solutions of management problems now under discussion in German forestry, such as size and type of management unit; site mapping; methods of ascertaining both quantity and quality of growing stock and increment, including detail required, site classes, and the use of general or local yield tables; yield regulation by area (not considered, as by some followers of the quasi-natural school, an obsolete concept); working-plan control; and financial profit-and-loss computation.

2001. RICHTER, A. Zur Frage einer standortsgerechten Forsteinrichtung. **[Site-adapted forest management.]** *Allg. Forst- u. Jagdztg.* 127 (4), 1956 (80–5). [G.e.]

Describes the principles underlying the Provisional Management Instructions for East Germany and their application since 1953, with particular reference to site conditions, which are made the basis for the redrawing of subcompartments and their groupings [cf. *F.A.* 15 No. 2773].

2002. ASSMANN, E. Betriebsklassenmodelle. **[Models of felling series.]** *Allg. Forst- u. Jagdztg.* 127 (4), 1956 (85–90). [G.]

Presents diagrammatically the relations between growing stock, intermediate and final yields, according to data from Wiedemann's tables and 2 Bavarian trial plots, for moderately and heavily thinned Spruce. In Bavaria, the heavily thinned stand shows lower financial and volume yields, attributed to a lower mean age at felling and lower mean heights of trees of given diameter in heavily thinned stands.

2003. DAVIS, K. P. **Determination of desirable growing stock—a central problem of forest management.** *J. For.* 54 (12), 1956 (811–5).

Discusses, with diagrams, the factors to be considered in determining the desirable growing stock of even- and uneven-aged forest.

2004. RAVE, A. Plenterwald—Altersklassenwald. **[Selection forest—age-class forest.]** *Allg. Forst- u. Jagdztg.* 126 (11/12), 1955 (247–8). [G.e.]

A theoretical discussion on the comparative yields, in terms of volume and value, of the selection and shelterwood systems, mainly for Spruce and Silver Fir, expressing the view, backed by the author's interpretation of figures from Schwarzwald trial plots, that shelterwood with a long regeneration period is more productive than the selection system.

2005. MITSCHERLICH, G. Unsichere Rechenkünste. **[Doubtful calculations.]** *Allg. Forst- u. Jagdztg.* 127 (2), 1956 (56–8). [G.]

A critical rejoinder to Rave's article [see preceding abstract], disputing the basis of his computations on yields in shelterwood systems.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also No. 1406.

2006. DIETERICH, V. Beziehungen der forstlichen Wirtschaftslehre zur Forsteinrichtungspraxis. **[The relations between forest economics and forest management.]** *Allg. Forst- u. Jagdztg.* 127 (4), 1956 (62–9). 12 refs. [G.e.]

A general article, mainly on the points to be considered in working plans from the economic point of view, the detail required, e.g. on quality, assortments, accessibility; differences necessitated by size and ownership type, the tending costs for plantations etc., related to annual cuts, and the problems of monetary accounting over long periods.

2007. STRÖMSBERG, E. Norsk driftsplanering. **[Planning management in Norway.]** *Norrlands SkogsvFörb. Tidskr.* 1956 (2), (125–203). [Sw.]

Discusses the concept of 'felling class' in Norway [cf. *F.A.* 13 No. 2358], describes forest conditions (role of forestry in the Norwegian economy, distribution of forests, relation of existing to normal forests, site classes, ownership categories), and gives examples, especially for commercial forests and large estates, of survey methods and types of working plan used.

2008. GEVORKIANTZ, S. R. **Managing hardwoods for quality increment.** *J. For.* 54 (12), 1956 (836–40). 2 refs.

Discusses the management of stands of the northern hardwood type, with regard to stand improvement and release [cf. *F.A.* 15 No. 2384], desirable stocking, growth capacity of individual trees and crown 'efficiency', a concept discussed at some length. Methods for evaluating logs by quality and value are given.

2009. URQUHART, B. **Working plans for private woodlands.** *Quart. J. For.* 50 (4), 1956 (294–302). 5 refs.

Working plans for private woodlands prepared before the introduction of the Forestry Commission's Dedication Scheme are reviewed and the [Commission's] original plan of operations examined. The recently introduced revised plan is criticized and suggestions are made to simplify it, to enable the forest manager to concentrate on the field work necessary to build up flexible working plans suitable to the varying conditions of private woodlands and to avoid unnecessary clerical labour. *From author's summary.*

64. Forestry as a Business: General

See also Nos. 1477, 1655, 2006.

2010. HJELM, L. Undersökning rörande jord- och skogsbrukets relativa lönsamhet. **[The relative profitability of agriculture and forestry.]** *Meddelande från Jordbrukets Utredningsinstitut, Stockholm* 1956 (2). pp. 69. 8 refs. [Sw.sw.e.] O.A.Ec.

Gives a preliminary outline of the calculations of profitability for units of different size in S. and central and in N. Sweden. Indicates the productivity levels at which farming will be more profitable than forestry on land with and without existing buildings, good field lay-out, etc. A supplement by *E. Hagberg* discusses the calculation of profitability in forestry and gives tables showing estimated returns from forests on different site classes.

2011. AMLING, F. **Forest land as an investment in New England.** *Abstr.* of *thesis*, in *New England Business Review, Boston* Oct., 1956 (1–5). X.

Compares results of a survey of growth rates, markets, operating costs, net operating income and rates of return in New England, the Lake States and the South. Concludes that, in spite of the smaller output and less good markets, forest ownership in New England can be profitable if the original investment is low and good growth rates are maintained without great expense.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 1459, 1501, 1558, 1605, 1617, 1978, 1992, 2002, 2006, 2008, 2010–1, 2388–9.

2012. MACGREGOR, J. J., IRVINE, T. W., and BALMAN, F. E. **Survey of private forestry costs: England and Wales. No. 4. Fourth annual report for forest years 1953–54 and 1954–55.** Imperial Forestry Institute, Oxford. 1956. pp. 94. Price 7*s.* 6*d.* [Cf. *F.A.* 17 No. 735.]

2013. ANDERSSON, S.-O. W-värden för norrländska tallplanteringar. **[Capital values for Norrland Pine plantations.]** *Skogen* 43 (14/15), 1956 (414–5). [Sw.]

Discusses the methods used in constructing yield tables (to be published later) for planted Pine in Norrland, supplementing actual data from 25- to 50-year-old material with data calculated from figures for natural stands for material > 50 years old. Presents a table showing the 'W-value' [present value of all future net yields/ha. expected for a given piece of forest land, regeneration costs being disregarded] for planted Pine in N. Sweden, site class h_{100} (upper height at 100 years) = 24 m., for densities of 2000–4000 stems/ha. before thinning, for good medium and poor markets and for interest rates of $2\frac{1}{2}$, 3 and 4%.

2014. THONET, H. M. Über die Entschädigung von Walddurchhieben. **[Compensation for power-line rides.]** *Allg. Forstztg.* 66 (5/6), 1955 (61–2). [G.]

Discusses the various components, actual and potential, involved in the computation of compensation, and the relative Austrian legal provisions, with particular reference to the relation between loss of future yields and loss through premature cutting of the present growing stock, to avoid double compensation.

66. Costing of Logging Operations

See Nos. 1665, 1668, 1673–5, 1685–8, 1693, 1696, 1720–1.

67. Assessment of Financial Results; Bookkeeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also Nos. 1938, 2006.

2015. HILEY, W. E. **An examination of the accounts for the years 1953–54 and 1954–55.** Dartington Woodlands Ltd., Totnes, Devon. 1956. pp. 18. Price 4*s.* [Cf. *F.A.* 13 No. 2366.]

2016. BONHOF, E. B. Proef van een bosbouwtechnische boekhoudcode. **[Trial of a classification for book-keeping in forestry.]** *Ned. Boschb.-Tijdschr.* 27 (8), 1955 (189–208). [Du.]

Presents a decimal classification with detailed subdivisions under 5 main heads, with explanatory notes. Discusses its development, its use in practice, the degree of subdivision likely to be useful to smaller concerns, and the collection and recording of data.

68. Administration and Organization of Forest Enterprises

See also No. 1655.

681. National (Federal, State) Forest Services and Administration

2017. FARRON, P. E. Augmentation et amélioration de la production forestière. **[Increasing the forest yield in quantity and quality.]** *Forêt, Neuchâtel* 10 (2), 1956 (40–4). [F.]

The author considers that the most effective single measure would be to place all communal forests in Switzerland (ca. 750,000 ha.) under direct management by cantonal forest officers. He cites the example of Canton Bern, where the average yield of directly managed communal forests is 7 cu.m./ha. against 5 cu.m./ha. in those merely supervised.

2018. Serviço Florestal do Estado de S. Paulo. Sessenta anos dedicados à proteção das matas. **[São Paulo State Forest Service. Sixty years dedicated to the protection of the forests.]** *Brasil madeireiro* 11 (113), 1956 (9–13). [Port.]

A short history of the service and its work.

682. Private Forest Administration. Staff Questions in Private Forestry

2019. HALMEKOSKI, M. Tutkimuksia metsäteollisuuden metsäosastojen henkilöorganisaation rakenteesta. **[Studies concerning the structure of personnel organization in the forest departments of the [Finnish] forest industry.]** *Acta for. fenn.* 64 (1), 1955 (1956). pp. 179. 200 refs. [Fi.e.*e.*]

Discusses in detail work-study methods for investigating the organization of personnel in the forestry departments of private firms in Finland. There is a 16-page English summary.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See Nos. 1685, 2033.

687. Planning and Organization of the Transport of Men, Supplies and Equipment

See also No. 1696.

2020. HANSBROUGH, T. **Potential uses of helicopters in forestry.** *J. For.* 54 (12), 1956 (817–21). 13 refs.

Discusses the use of helicopters in fire control, timber surveying, direct sowing, and insect and disease control. A comparison of costs and specifications is given for 4 American makes.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

71. Marketing of Forest Products: General

See also No. 2030.

2021. **Report of the Committee on Marketing of Woodland Produce 1956.** Forestry Commission London. 1956. pp. 97. Price 4*s.* 6*d.*

The Committee's terms of reference were: 'With the object of promoting confidence and stability, and bearing in mind both the output from Forestry Commission woodlands and the need to develop markets, to consider what measures might be taken within the home timber industry to improve the arrangements for marketing from privately owned woodlands; and to report'. The Committee concludes that there is urgent need of: (1) a strong and effective association of private woodland owners, and (2) a central consultative body representative of all the principal interests concerned in the marketing of home-grown timber, and suggestions are made for the organization and powers of such bodies.

2022. Streinz, W. Zur Durchforstungsfrage. **[The thinning problem.]** *Allg. Forstztg.* 66 (19/20), 1955 (259–61). [G.]

Contains practical proposals for organizing the sale of thinnings to the pulp and paper industry, and the assistance to be given to small owners (whose woods contain most of the thinning reserves, estimated at 500,000 cu.m. per annum for at least 10 years), such as training in one-man work, loan of transport, collection depots, and credits. [Cf. *F.A.* 18 No. 1600.]

2023. Webster, H. H. **An economic analysis of mine-timber marketing in West Virginia.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 84, 1956, pp. 24. 1 ref.

2024. Filho, E. Marques. As madeiras brasileiras no mercado argentino. **[Brazilian timbers in the Argentine market.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 8, 1955 (121–40). [Port.e.]

A report relating mainly to Parana Pine during the years 1953–55, but dealing chiefly with the year 1955.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

2025. Ervasti, S. Viedyn havusahatavaran koostumuksen muutokset. **[Changes in the composition of sawn timber exported from Finland.]** *Metsät. Aikak.* 1956 (6/7), (217–20). [Fi.e.]

Changes between 1860 and 1952 are shown in graphs, including data on dimensions, quality, and species.

2026. **America's demand for wood 1929–1975: a report by the Stanford Research Institute, Stanford, California to Weyerhaeuser Timber Company, Tacoma, Washington.** Weyerhaeuser Timber Company, Tacoma, Washington. 1954. pp. 404. Limited distribution. [Cf. *F.A.* 16 Nos. 2093–4.]

2027. Sternitzke, H. S. **Stumpwood supplies [for resin distillation] in Southeast Texas.** *Naval Stores Rev.* 66 (6), 1956 (8).

Tabulates figures per country by area and by tonnage, and totals by size class, distinguishing present and potential stumps in each case. At present rate of removal, the supply can last only a few years.

2028. Quadros estatísticos. **[Statistical tables.]** *An bras. Econ. flor., Inst. nac. Pinho* No. 8, 1955 (i–xlvi). [Port.]

An appendix giving figures for Brazilian production and exports of wood and wood products during 1954 and 1955.

2029. Scott, C. W. La exportación de madera aserrada de pino insigne de Nueva Zelandia a Australia. Factores de esta exportación que son importantes para el futuro del pino insigne en Chile. **[Exports of sawn timber of *Pinus radiata* from New Zealand to Australia. Factors of importance for the future of *P. radiata* in Chile.]** *Luma, Concepción* 1 (1), 1955 (5–10). [Span.span.]

A review of the present situation, with recommendations for increasing exports of *P. radiata* from Chile.

73. Prices

2030. Nomura, I. **[Theoretical studies on formation of forest products prices. (2nd Report)—Studies on the market structure of forest products in Japan.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 85, 1956 (1–115). 30 refs. [Jap.e.]

Analyses (citing 4 independent local charcoal markets, the common-use timber market of Tokyo and the national market in pulpwood) the effects on price formation of supply and demand, the vertical and horizontal structure of the market, agents, function, and forms of dealing. There is a 9-page English summary. [Cf. *F.A.* 17 No. 3161.]

74. Trade Policy

See Nos. 2021–2.

75. Trade Customs and Usages

2031. Neufassung der Gebräuche im Verkehr mit inländischem Rundholz, Schnittholz und Holzhalbwaren. **[Revised customs and usages in the inland trade in round timber, sawn timber, and semi-finished timber products.]** *Holz-Zbl.* 82 (140/141), 1956 (1696–8). [G.]

A revised re-issue of the 'Tegernseer Usances' of 1950, agreed by the representatives of the timber trade and the sawmilling and wood-consuming industries and trades, dealing with general commercial questions, such as tolerances as to quantity and quality, complaints, damage in transit, etc., as applying to round and sawn timber, mining timber, plywood and veneers. It does not contain grading rules.

2032. Lemmel, H. Über den Einfluss der Verkaufsformen auf den Holzmarkt. **[The influence of methods of sale on the timber market.]** *Forstarchiv* 26 (1), 1955 (8–11). 11 refs. [G.g.]

Summarizes the main points in this argument. Public auction is recognized as the best method, but selling to a restricted circle of bidders does not properly reflect supply and demand. Regional sales with methods and prices reflecting regional conditions are preferable to centralized sales.

78. Economics of Transport

See also No. 2356.

2033. Aston, E. R., *et al.* **Natural resource roads needed.** *Timberman* 58 (1*A*), 1956 (44–5).

The need is stressed for improving the 5% of the highways carrying to the user the forest products that, for some states, represent 50% of their total economy. The %'s of such roads in California, Idaho, Montana and Washington are estimated, with some data on bd. ft./miles/year. Tandem axles transport about 175% of the load of single axles with the same road surface wear. Specifications for a 40,000-lb. tandem-axle load on a haul or timber access road, based on Idaho tests, are given.

2034. **'Caspiana' case appeal.** *Timb. Tr. J.* 219 (4187), 1956 (63).

The judgement referred to [see *F.A.* 17 No. 1898] was reversed in the court of appeal, and this decision

has now been upheld by the House of Lords. It was held that the war-risk clauses stamped across the bill of lading were not in conflict with the main object of the contract, i.e. the delivery of the Canadian timber at London or Hull. Because of the dock strikes there, the shippers were entitled to earn their freight by discharging at Hamburg.

79. Economics of the Wood Industries

See also Nos. 2026, 2044, 2159, 2361.

2035. **The fibre building board industry in Europe: a study by a specialized working party of the OEEC.** Organisation for European Economic Co-operation, Paris. 1956. pp. 87.

Gives statistics of production, consumption, imports and exports for the member countries of OEEC, with some account of uses in building.

2036. **Pulp and paper statistics 1955: production and consumption of paper and board and woodpulp in O.E.E.C. member countries.** Organisation for European Economic Co-operation, Paris. 1956. pp. 73.

2037. JONES, D. **The pulp and paper industry's contribution to Canada's economic future.** *Pulp Paper Mag. Can.* 57 (10), 1956 (137–43).

Covers the aims and organization of the Canadian Pulp and Paper Association and of its Research Institute, past and future technological progress, the development, size and structure of the industry, probable demand for pulp and paper, and forest supplies of pulpwood, their conservation, extension and improvement; an article based on the Association's brief to the Royal Commission on Canada's economic future.

2038. FULLING, E. H. **Botanical aspects of the paper-pulp and tanning industries in the United States—an economic and historical survey.** *Amer. J. Bot.* 43 (8), 1956 (620–34). 39 refs. O.B.D.

Reviews the development of the industries, and species used, from the establishment of the first undertakings in the U.S.A.

2039. DIXON, L. B. **Birth of the lumber industry in British Columbia.** *B.C. Lumberm.* 39 (11; 12), 1955 (38–40, 75 . . . 78; 54 . . . 59); 40 (1–9), 1956 (38 . . . 40; 52 . . . 58; 44 . . . 47, 74–5; 42 . . . 48; 59 . . . 62; 58 . . . 62; 44 . . . 46; 70–2; 50 . . . 56). Many refs.

Chiefly a description of improvements in logging and the growth of sawmilling in the second half of the 19th century, with about 100 references to local archives.

2040. LONGWOOD, F. R. **Industrial wood use in Puerto Rico.** *Carib. For.* 16 (3/4), 1955 (64–97).

Surveys the present wood-using industries in Puerto Rico, of which the most important is furniture manufacture. The raw materials are discussed, their quality, amounts, costs, technical aspects and management, and recommendations made for improvements. The forests of Puerto Rico contribute $< 2\%$ of the country's total consumption, and there is room for much development in the use of native timbers.

2041. **The wooden case industry of N.S.W.** *Aust. Timb. J.* 22 (7), 1956 (781 . . . 788). 5 tbls.

Tabulates and discusses total case-timber production, sources, imports, use by commodities packed, and effect of fibreboard competition in New South Wales. About half the 48 million bd. ft. used in 1954–55 was Radiata Pine. Six of the 10 million cases used were for fresh fruit. [Cf. *F.A.* 17 No. 4365.]

2042. KÜHNE, H. Rapport au gouvernement de l'Iran sur l'utilisation du bois. [**Report to the Government of Iran on wood utilization.**] *Expanded Technical Assistance Program, FAO Report* No. 511, 1956. pp. 32 + 24 photos. [F.]

2043. MONROY, J. VAN. **Report to the Government of Indonesia on forest industry development program.** *Expanded Technical Assistance Program, FAO Report* No. 546, 1956. pp. 129 + 1 map.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 2042–3.

2044. **The work of Canadian Government agencies in relation to the forest products industries.** *For. Prod. J.* 6 (11), 1956 (20*A*–24*A*).

A panel discussion on the aims, resources, programmes etc. of the National Research Council (*R. F. Leggett*), the Forest Products Laboratories (*H. Schwartz*), the Central Mortgage and Housing Corporation (*I. E. Ashfield*), the Industry and Merchandising Division, Dominion Bureau of Statistics (*H. McLeod*) the Commodities Branch, Department of Trade and Commerce (*J. C. Dunn*), and the Canadian Standards Association (*J. H. Jenkins*).

2045. **[Forest products research in the Philippines.]** *Unasylva* 10 (3), 1956 (146).

Projects include: strength tests of Honduras Mahogany [*Swietenia macrophylla*]; materials for tool handles; strength of structural timbers; and the specific-gravity ranges of 32 species from 10 major regions.

2046. **Division of Forest Products programme of work 1956–57.** Forest Products Laboratory, Melbourne. 1956. pp. 51.

81. Wood and Bark: Structure and Properties

2047. HADER, R. J. **Some experimental designs applicable to problems with wood.** *For. Prod. J.* 6 (10), 1956 (425–7). 5 refs.

Discusses chiefly the method of incomplete blocks, and illustrates it by a description of the statistical techniques used in a plywood delamination test [see *F.A.* 18 No. 967].

810. General Information on Woods

See also Nos. 1331, 1351, 1357–8, 2261.

2048. **Properties of thinnings of home-grown Scots Pine (*Pinus sylvestris*). Progress report 1—Consignment No. 869. Progress report 2—Consignment No. 870.** Forest Products Research Laboratory, Princes Risborough. 1956. pp. 18 + pp. 15.

Both consignments (from the New Forest and from Morayshire) contained much grade-III material, largely as a result of knots. Working properties were good. Grade II and better would be equivalent to U/S Baltic Redwood.

2049. SPALT, H. A., and STERN, W. L. **Survey of African woods. I.** *Trop. Woods* No. 105, 1956 (13–38). 24 refs.

This study, undertaken with the Bureau of Ships, U.S. Navy, tabulates alphabetically, from British and American sources, the mechanical properties of 49 African timbers, the shrinkage of 37 and the decay resistance to brown and white rot of 21. Descriptions are given of the trees and timbers of the first 5 of the long list.

2050. D. Drei weitere Goldküstenhölzer. **[Three more Gold Coast timbers.]** *Holz-Zbl.* 82 (142), 1956 (1705–6). 7 refs. [G.]

Antiaris africana, Cistanthera papaverifera and *Cylicodiscus gabunensis*, with information on distribution, nomenclature, habit, wood properties and uses.

2051. **[New timbers.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (48–51, 79–80). 5 refs. [Du.e.]

Properties and uses of *Gonystylus bancanus* from Borneo, and Ekun (probably *Coelocaryon klainei*) from Spanish Guinea.

2052. ALMEIDA, D. GUILHERME DE, and COSTA, J. RODRIGUES DA. Madeiras do Brasil. Contribuição ao estudio dos exemplares existentes no mostruário do Serviço de Economia Rural. **[Timbers of Brazil. A study of specimens in the collection of the Serviço de Economia Rural.]** Serviço de Economia Rural, Ministério de Agricultura, Rio de Janeiro. 1956. pp. 56. 10 refs. [Port.]

An annotated list of 91 species in alphabetical order of native names, giving information on properties and uses of the timber (and, in some cases, ports of exporting and importing countries), with an index of scientific names.

2053. SAKS, E. V. Unerschlossene Holzvorkommen in Peru. **[Unexploited timber resources of Peru.]** *Holz-Zbl.* 83 (4), 1957 (32). [G.]

A general account of commercially useful timbers of N.E. Peru, their distribution, extraction and transport, actual, planned or potential, and utilization. Many species suitable for veneers and plywood are mentioned, including *Swietenia macrophylla, Calophyllum brasiliense, Juglans neotropica, Cedrela odorata* and *Hura crepitans.*

2054. **Specimen Woods Nos. 250–252.** *Suppls.* to *Wood* 21 (10–12), 1956. Each pp. 2.

Rose She-Oak (*Casuarina torulosa*), Crow's Ash (*Flindersia australis*), and W. Indian Satinwood (*Fagara flava*).

2055. Asamela. **[*Afrormosia elata.*]** *Bois For. Trop.* No. 50, 1956 (17–20). [F.]

Notes on its habitat, biological characteristics, wood structure and commercial aspects.

2056. Avodiré. **[*Turraeanthus africana.*]** *Bois For. Trop.* No. 49, 1956. (19–22). [F.]

2057. **Forest Red Gum.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 224, 1956 (4).

A note on the distribution, timber properties, seasoning, uses, and availability of the small number of timbers grouped under the standard trade reference name of *Eucalyptus tereticornis.*

2058. **Properties of Australian timbers: Queensland Maple [*Flindersia brayleyana* and *F. pimenteliana*].** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 222, 1956 (4).

Covers the habit and distribution, physical and working properties, shrinkage in kiln drying, uses, and availability.

2059. Kajoe gatel in Nieuw Guinea. **[Kajoe Gatel [possibly *Adina* sp.] in New Guinea.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (55–8, 81). 2 refs. [Du.e.]

Discusses its use locally for salt-water piling, and describes the wood, which is hard, heavy, fine-grained and reddish-brown and contains SiO_2. Laboratory analysis showed only 0·14% silica, based on oven-dry wood, possibly because the sample was mainly sapwood.

811. Structure, Identification

2060. DISSESCU, R. O metodă practică pentru conservarea secțiunilor transversale din trunchiul arborilor. **[A practical method of preserving transverse sections of tree boles.]** *Rev. Pădurilor* 70 (12), 1955 (620–1). [Rum.]

Describes a method of treating such sections by immersion in a saturated solution of NaCl to ensure their dimensional stability.

2061. **The preparation of wood for microscopic examination.** *Leafl. For. Prod. Res., Lond.* No. 40 (rev.) 1956. pp. 8. 3 refs.

[For previous edition see *F.A.* 9 No. 282.] Selection of material, and technique of softening and other preparatory treatments, cutting sections, mounting, etc., including techniques for charcoal, plywood and veneer.

2062. FREY-WYSSLING, K., MÜHLETHALER, K., and BOSSHARD, H. H. **The electron microscope in the service of the determination of *Pinus* species.** *Translation, British Paper and Board Industry Research Association, Kenley* [1956] pp. 3 + 2 + 1 tbl. Transl. by H. W. Emerton from *Holz Roh- u. Werkstoff* 13 (7), 1955 (245). Limited distribution.

The presence or absence of submicroscopic wart-like structures on the inner wall of bordered pits can be used to distinguish *Pinus* spp. [cf. *F.A.* 15 No. 4017].

2063. CHUDNOFF, M. **Minute anatomy and identification of the woods of Israel.** *Ilanoth* No. 3, 1956 (38–52). 4 refs. [E.e.heb.]

Includes descriptions of 48 species (22 families) with a dichotomous key and a grouping of genera under salient features.

2064. BIANCHI, A. T. J. Houtherkenning voor de pratijk. Inleiding tot de herkenning van loofhoutsoorten, in het bijzonder tropische soorten, met de loupe. **[Practical wood identification. Introduction to the identification of hardwoods, especially tropical species, using a hand lens.]** *Meded. Inst. Trop. Amst.* No. 114 (*Afd. trop. Prod.* No. 44) 1956. pp. 84 + 16 photos. [Du.]

Includes descriptions of some of the main features used in identification, short descriptions, with some drawings and photomicrographs, of woods of over 100 commercial species, and indexes of trade and scientific names.

2065. METCALFE, C. R. **The taxonomic affinities of *Sphenostemon* in the light of the anatomy of its stem and leaf.** *Kew Bull.* 1956 (2), (249–53). 6 refs.

Results confirm that *Sphenostemon*, *Nouhuysia* and *Idenburgia* are closely related. The anatomical evidence is insufficient to show whether the group is unigeneric, but it is clear that none of the three is closely related to the Monimiaceae, Aquifoliaceae or Guttiferae. Styloid crystals, rare in the dicotyledons as a whole, occurred in all the material examined; other similarities, and differences, are listed.

2066. JASKEVIČ, R. T. Osobennosti anatomičeskogo stroenija drevesiny nekotoryh vidov mindalja. **[Anatomical features of the wood of some species of *Amygdalus*.]** *Bot. Ž.* 41 (8), 1956 (1172–7). 7 refs. [Russ.]

Discusses the anatomical characters of wood of *Amygdalus nana*, *A. fenzliana*, *A. nairica*, *A. spinosissima*, *A. communis*, *A. bucharica* and *A. ulmifolia*, tabulating data on ray height and width, and pore diameter. A generic description of the wood of *Amygdalus* and some notes on leaf structure are included.

2067. INGLE, H. D. **A note on the wood anatomy of the genus *Corynocarpus*.** *Trop. Woods* No. 105, 1956 (8–12). 6 refs.

An examination of seven samples covering 4 species indicates that the genus should be moved from near the Anacardiaceae (where Bentham and Hooker placed it) to the Malvales. The genera of Berberidaceae mentioned by Metcalfe and Chalk as having affinities with it, are distinguished by their lack of parenchyma.

2068. CHOWDHURY, K. A., and GHOSH, S. S. **Aid of anatomy in the discovery of *Mansonia dipikae* Purkayastha.** *Indian For.* 82 (9), 1956 (444–8 + 1 plate). 20 refs.

An account of this species, discovered in Assam in 1947 and at first believed to be a specimen of *Sterculia alata*. The wood is described in detail, with 5 photomicrographs.

811.1. Anatomical Elements and Tissues

See also Nos. 1395–6, 1987, 2062, 2220–1, 2261, 2271–2.

2069. **Growth in plant cells.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55*, 1955 (91).

It has been previously shown that, in the formation of wood fibres, surface growth proceeds in length at the cell tips and in breadth at centres over the cell surface—the region of the pit fields. A similar mechanism had also been proposed for parenchyma cells, but investigation has shown that during extension growth the pit fields tend to remain constant in number and to separate during extension. This change is accompanied by an increase in the dispersion of microfibrils between the pit fields, so that to some extent the cell wall appears to be stretched during extension.

2070. WARDROP, A. B., and DADSWELL, H. E. **The development and structure of wood fibres [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 8, 1954 (6–26). 30 refs.

Reviews available information on the development of primary and secondary walls of wood fibres, with particular attention to the texture of the cell wall and to lignification theories. The possibility of a paracrystalline region surrounding micelles has been taken as the basis for discussing the relationship between the size of microfibrils as revealed by electron microscopy and that of micelles determined by X-ray methods. A mechanism is suggested by which the primary wall might develop during cell extension and radial expansion. It is also noted that the thickening of the secondary wall progresses gradually towards the cell tips. Possible mechanisms for deposition of lignin during cell differentiation are discussed; it is pointed out that, in certain cells of the angiosperms, such as tension-wood fibres, there is a definite lack of lignification compared with other cells in the same wood sample. The possibility is mentioned of some correlation between the degree of cell-wall lignification and the grinding quality of Eucalypt woods used for groundwood. *From authors' summary.*

2071. **Cell wall texture.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55*, 1955 (91).

It was observed, when comparing cellulose of normal wood (n.w.) with that of tension wood (t.w.) that: (1) the apparent crystal (micelle) size is less in n.w. than in t.w.; (2) the increase in apparent crystal size on hydrolysis is less in t.w. than in n.w.; (3) the intermicellar spaces, as indicated by the size of crystals deposited in the sample, are the same in n.w. and t.w.; and (4) the moisture recovery is less in t.w. than in n.w. These investigations thus provide a physical interpretation of concepts such as the crystalline/non-crystalline ratio. In more recent work, examples have been obtained in which it appears that the cellulose exists wholly in the paracrystalline condition.

2072. BANNAN, M. W., and BAYLY, I. L. **Cell size and survival in conifer cambium.** *Canad. J. Bot.* 34 (5), 1956 (769–76). 24 refs. O.R.S.

The largest fusiform initials generally survive and repeat the cycle of elongation and multiplication by pseudo-transverse division. The cells of intermediate length continue or fail in varying proportions, the rate of failure tending to rise with increasing frequency of anticlinal division. As a rule, the initials with the largest area of ray contacts persist and those with sparse ray contacts decline. The shortest fusiform initials are usually lost, passing off into maturation or undergoing further diminution to ray initials. The continued selection of the longest of the newly formed fusiform initials, which is operative at all stages in tree growth, undoubtedly contributes to the maintenance of an efficient cell length in the secondary vascular tissues. *From authors' summary.*

2073. Megli, V. Prove di degemmazione nel pesco e loro effetti sulla istogenesi della cerchia legnosa. **[Experiments in disbudding of *Prunus persica* and their effects on growth-ring formation.]** *Nuovo G. bot. ital.* (*n.s.*) 62 (1/2), 1955 (41–74). 14 refs. [It.e.] A.P.B.

The part played by growth-regulating substances in the formation of annual rings was studied by gradual disbudding and defoliating of Peach trees. Removal of terminal buds caused greater width of annual ring and a more marked uniformity of structure due to greater frequency of vascular elements. Defoliation, on the other hand, completely inhibited cambial activity. These results are held to support the hypothesis that the leaves produce an inactive form of a substance that stimulates the formation of wood elements and the differentiation of newly formed elements. This inactive substance would normally exert its influence only when the buds, towards which it is directed, had transformed it into its active form. When the buds are removed, the inactive substance is probably activated by the cambium and its circulation is consequently more extensive and lasts longer, producing in the annual ring those characters peculiar to early wood, which is usually formed at the season when the circulation of this substance is at its maximum. The paper is illustrated by photomicrographs of the wood of treated twigs.

2074. Mancuso, B. Anomalie anatomiche nel legno di rami di ciliegio sottoposti a defogliazione. **[Anatomical anomalies in the wood of defoliated branches of a Cherry tree.]** *Nuovo G. bot. ital.* (*n.s.*) 62 (1/2), 1955 (335–44). 4 refs. [It.] A.P.B.

Study of defoliated branches and comparison with untreated controls, showed a close connexion between the number of leaves and differentiation of secondary wood elements. Width of annual ring was directly related to quantity of leaves, and in inverse ratio to quantity of flowers. Defoliated branches showed shorter fibres with a tendency to gelatinization in the parenchyma. [Cf. *F.A.* 14 No. 627.]

811.2. Special Features and Abnormal Structure

See also Nos. 2071, 2250, 2254.

2075. Ollinmaa, P. J. Koivun vetoppuun anatomisesta rakenteesta ja ominaisuuksista. **[On the anatomical structure and properties of the tension wood in Birch.]** *Acta for. fenn.* 64 (3), 1955 (1956). pp. 263. 345 refs. [Fi.e.*e.*]

A detailed study, based on investigation of 108 trees equally divided between *Betula pubescens* and *B. verrucosa*, and including measurements and observations on macroscopic and microscopic structure, fibre length etc., physical and mechanical properties, chemical constitution, and possible disadvantages in use, of tension wood. There is a 37-page English résumé.

2076. Wardrop, A. B., and Scaife, E. **Occurrence of peroxidase in tension wood of angiosperms.** *Nature, Lond.* 178 (4538), 1956 (867). 7 refs.

In order to examine the nature of the asymmetry of lignification in stems forming tension wood, the peroxidase distribution was studied. In the zone of tissue including the cambium, no peripheral variation in the amount of peroxidase in stems of *Eucalyptus goniocalyx* and *E. cladocalyx* could be seen, but in the mature tension wood intense peroxidase activity was observed in the unlignified region of the fibre cell walls. The peroxidase reaction was not obtained if the sections were first treated with cyanide. Addition of H_2O_2 to the tissue did not result in the formation of any lignin-like substances. It thus appears that the failure of tension wood to lignify may result from the differential formation of the lignin precursor on the two sides of the stem. Further investigations are in progress by the writers, at Melbourne.

811.4. Growth Rings. Early and Late Wood

See also Nos. 1987, 2073–4.

2077. Miller, S. R., and Malac, B. F. **A method for determining percent summerwood in coniferous wood samples.** *J. For.* 54 (11), 1955 (756–8).

The new method, evolved to test the possibility of using the late-wood % as a measure of sp. gr., is claimed to be applicable to round timber and to be more accurate and quicker than methods previously used. It is based on the cross-sectional area of a wedge, which is calculated according to the formula

$$\pi R^2 \frac{\theta^\circ}{360^\circ},$$

where R = total radius and θ° = number of degrees in the arc. For the area of a late-wood ring, the area of the sector to its inner margin is subtracted from the area to its outer margin. To obtain the area of all the late-wood as a % of the total area, a simplified formula is developed for ready use with an automatic or semi-automatic calculating machine. The accuracy of the method depends on (*a*) the degree to which rings deviate from a circular form and to which the width of ring varies round the tree, (*b*) the sharpness of the transition from spring wood to summer wood and (*c*) random selection of points of measurement.

2078. Smith, D. M. **Effect of growth zone on specific gravity and percentage of summer wood in wide-ringed Douglas Fir.** *Rep. U.S. For. Prod. Lab.*,

Madison No. 2057, 1956. pp. 9 + 1 gph., 6 tbls. 10 refs. P.R.

The relationship between density of the growth-ring components and % of late wood, which was observed in a previous study [see *F.A.* 17 No. 3207], remains unchanged regardless of the zone of origin within the tree. For complete growth rings and the late wood of dissected rings, the regression of mean density for the zones on mean % of late wood follows the same trend as the within-zone regressions. In early wood there is a significant difference in the trend of the within- and between-zone regressions. *From author's summary.*

811.5. Sapwood and Heartwood

See also Nos. 2251–3.

2079. LUND, A. E., and SCIASCIA, M. **A new colour indicator for the differentiation of sapwood and heartwood in Douglas Fir.** *For. Prod. J.* 6 (11), 1956 (483–4). 7 refs.

Describes the use of a 0·04% Brom-cresol Green solution which produced a sharp delineating line on all sections tested. A wetting agent was necessary for fast reaction on oven-dry specimens. The reagent cannot be used where abnormal environmental conditions affect the pH of the wood.

812. Physical and Mechanical Properties

See also No. 2075.

2080. DICKINSON, F. E., and BRUNEAU, G. P. **A small, controlled temperature-humidity cabinet.** *Mich. Wood Technol.* No. 6, 1955. pp. [4]. P.R.

Illustrated description of a cabinet developed at the University of Michigan to fulfil the following requirements: adequate air circulation; temperature control between 100 and 212° F.; relative humidity control from 0 to 97%; corrosion-resistant lining; low heat loss; and adequate loading space.

2081. SOUSA, O. DE ALMEIDA E. Primeiros dados experimentais sobre as características físicomecânicas de madeira portuguesa de *Pseudotsuga taxifolia* Carr. **[Preliminary data on the physical and mechanical properties of wood from Portuguese-grown *P. taxifolia*.]** *Estud. Inform Serv. flor. aqüic. Portugal* No. 66-*D*3, 1956. pp. 23. 8 refs. [Port.] Limited distribution.

Presents the results of tests of the physical and mechanical properties and resistance to decay of specimens from 3 trees grown in Portugal and compares them with similar data for trees from the U.S.A. The Portuguese-grown wood compared well with the American.

2082. MIGONE, E., and PRESTON, S. B. **Physical and mechanical properties of certain woods from Paraguay.** *Mich. Wood Technol.* No. 7, 1955. pp. 4. 1 ref. P.R.

Density, strength and calorific values were determined for *Piptadenia macrocarpa*, *Tabebuia ipe*, *T. ochracea*, *Pterogyne nitens*, *Myrocarpus frondosus*, *Peltophorum dubium*, *Cordia hypoleuca*, *Cedrela fissilis*, and *Enterolobium guaraniticum*.

2083. NOVRUSOVA, S. A. **[Physical and mechanical properties of the wood of *Diospyros lotus*.]** *Izvestija Akademii Nauk Azerbaïdžanskoĭ SSR* 1955 (3), (37–49). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 10 (5), 1956 (157). [G.] P.R.

The wood is yellowish, and the vessels are quite large, whereas the rays can hardly be seen in section by the naked eye. The density is 0·74 g./c.c. and changes little on drying. In strength and hardness, the species belongs to the second [U.S.S.R.?] group of timbers. The difference in tensile and shear strength between the radial and tangential directions is insignificant. The timber is less valuable than those of *Parrottia persica* and *Quercus castaneaefolia*, which are associated with it in the Caucasus.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 2146, 2276.

2084. OGARKOVA, T. V. Temperaturnye deformacii drevesiny pri nagrevanii. **[Temperature deformations of wood during heating.]** *Derev. Prom.* 5 (5), 1956 (17–8). [Russ.russ.] P.R.

Birch-wood test-pieces 12 × 1 × 1 cm. were weighed and then heated to a constant temperature in a thermostatically controlled oven, the corresponding changes in linear dimension (resulting from thermal expansion and shrinkage due to unavoidable drying) being concurrently measured. When the test-piece had reached a constant temperature, it was weighed *in situ*, and maintained there for some time while dimensional changes (due to shrinkage only) were measured. Finally it was again weighed. This procedure enabled the thermal expansion to be determined. For Birch wood of 11·8% initial m.c. the coefficient of thermal expansion was: along the grain $10{\cdot}0 \times 10^{-6}$ (total temperature change 77° C.); and across the grain 71×10^{-6} (total temperature change 79°). The coefficient of shrinkage was: along the grain 0·0049% (total m.c. change 5·14%); and across the grain 0·246% (total m.c. change 3·55%). Thus shrinkage per 1% m.c. produces the same deformation as a temperature change of 35° (across the grain), and of 5° (along the grain).

2085. **Sorption studies.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55*, 1955 (93).

[Cf. *F.A.* 18 No. 884.] Direct measurements of the heat of wetting of wood (sawdust) have been made, using an adiabatic calorimeter. Measurements were made at 26, 36, and 46° C. on samples with initial m.c. varying from 0 to 24%. The heat evolved on wetting decreased with increasing temperature, thus confirming earlier predictions based on variation of specific heat with m.c. Sorption cycles between 0 and 99% relative humidity (r.h.) have been completed at two temperatures (25 and 40°) for matched samples of *Araucaria klinkii*. It was confirmed that the equilibrium m.c. at any given r.h. was lower, and the width of the hysteresis loop smaller at the higher temperature.

2086. TRAPP, W., and PUNGS, L. Einfluss von Temperatur und Feuchte auf das dielektrische Verhalten von Naturholz im grossen Frequenzbereich. **[Effect of temperature and moisture content**

on the dielectric properties of untreated wood over a large frequency range.] *Holzforschung, Berlin* 10 (5), 1956 (144–50). 15 refs. [G.g.e.] P.R.

[Cf. *F.A.* 18 No. 887.] The dielectric loss factor and permittivity were measured for Spruce wood at different moisture contents (0–100%), temperatures (20–100° C.), and frequencies ($10–10^{10}$ cycles/sec.). Three sorption ranges (roughly 0–5%, 5–20% and over 20% m.c.) can be distinguished in the graphs obtained: in the first range (ca. 3% m.c.) the loss factor does not differ appreciably from the value for oven-dry wood; in the second (adsorption range), both the loss factor and permittivity rise steeply with the increase of m.c.; in the third (capillary condensation range), the rise of the loss factor with m.c. is more gradual. The authors attempt to explain the results on the basis of the theories of Debye, Wagner, Dänzer and other investigators.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 2085–6, 2242–3, 2254, 2264, 2283.

2087. Gagnon, H., Pharo, G., and Mimeault, P. **The 'Atrometer' moisture measuring instrument.** *Pulp Paper Mag. Can.* 57 (11), 1956 (149–50).

Describes the operation of a meter, consisting of an amplifier and feelers, the latter containing a hygroscopic substance setting up an electrical resistance. The feelers measure, and dials show for each feeler, the varying moisture content of the air film next the passing web of raw newsprint, while the mean value of the feelers' measurements is recorded on a strip. Samples taken over a month and tested gravimetrically, show an accuracy of ± 1% m.c. In 55% of the samples the difference was 0 to 0·2%.

2088. McClung, J. M., and Mikelson, W. **Continuous moisture measurement with General Electric moisture monitor.** *Pulp Paper Mag. Can.* 57 (11), 1956 (155–6).

Describes the operation and tuning of a meter that depends on the alteration in an electrical capacitator of its capacitance when a sheet of paper is placed within its electrostatic field. The significant effect is due to the presence of water (dielectric constant 80) against that of dry paper (about 3) but depending on pulp, fillers and additives used. In a given paper, weight is the primary factor affecting this constant.

2089. Gunnason, J. **Automatic control of veneer moisture content.** *Veneers & Plyw.* 49 (1), 1955 (12, 27). P.R.

Illustrated description of a continuous moisture detector based on the conductance and capacitance of the tested materials. An electrode scanning system extends across an entire veneer sheet and indicates its m.c. as the veneer passes through the electronic field.

2090. Kontinuierlicher Feuchtigkeitsmesser mit Linienschreiber. **[Continuous moisture meter with recording device.]** *Holz-Zbl.* 82 (150), 1956 (1791). [G.]

This German electrical moisture meter is designed for installation on conveyor belts carrying working material in floor-block, veneer, and chipboard factories etc. It can be fitted, for each purpose, with suitable electrodes whose pressure on the tested material can be varied. Indicators can be set to actuate warning lights or buzzers if permissible m.c. is exceeded. The recording device, producing a continuous graph, is optional.

2091. Bielczyk, S., and Eminowicz, A. Wilgotność drewna drzew żywych. **[Moisture content of the wood of standing trees.]** *Roczn. Nauk leśn.* No. 7, 1954 (5–30). 10 refs. [Pol.pol.russ.e.] P.R.

The moisture content (m.c.) was determined for increment cores, the first weighing being made immediately after boring. Preliminary tests with Scots Pine, Oak and Beech showed that the mean error inherent in this method varied from 4 to 14%. The actual tests were made on 5 trees each of Scots Pine, Larch, Spruce, Oak, Beech, Alder and Birch, 4 Maple and 2 Ash, nearly all being ca. 50 years old. Two measurements were made in February, then one per month until December. In coniferous trees the mean m.c. of the sapwood (s.w.) was ca. 60% greater than for heartwood (h.w.) whereas in broadleaved species it was greater in some and less in others. In broadleaved species without true heart the m.c. was 99% for the Maple false heart and 64% for Beech. Coniferous s.w. had a higher m.c. during the rest period than during growth; the differences were smaller in the h.w. There was hardly any difference between the two periods for broadleaved species with true heart, whereas those without true heart behaved like the conifers. Seasonal changes of m.c. were most prominent in conifers (particularly in s.w.), showing a maximum in February and a minimum in the second half of the rest period; the behaviour of broadleaved species was more individual. The greatest constancy of m.c. among the individuals of a species was found in h.w. of Larch and Scots Pine and in s.w. of Ash, Maple, and Beech.

2092. Huber, H. A. **A study of across-the-grain shrinkage during drying.** *Mich. Wood Technol.* No. 10, 1956. pp. 2. P.R.

It was found that, when a board dries, a certain amount of the total shrinkage may be caused by compression set, and the greater the set the smaller is the final dimension of the board. The data suggest that, when the relief of drying stresses occurs, a portion of the compression set may also be relieved. *Author's summary.*

2093. Kelsey, K. E. **The shrinkage intersection point—its significance and the method of its determination.** *For. Prod. J.* 6 (10), 1956 (411–7). 17 refs.

The shrinkage intersection point, defined as the moisture content (m.c.) at which the extended linear part of the shrinkage/m.c. curve intersects the line of zero shrinkage, was determined for 6 species, and the values obtained by different methods were compared. The possibility of estimating the intersection point from the basic density and volumetric shrinkage was studied, and a correlation coefficient of

0·76 found to exist between unit volumetric shrinkage and basic density for 131 Australian and Pacific Island species. A correlation was also observed between the intersection point and the equilibrium moisture content at any given relative humidity for 5 species. *From author's abstract.*

2094. HANMAMEDOV, K. M. **[Swelling relationships of some wood species.]** *Izvestija Akademii Nauk Azerbaĭdžanskoĭ SSR* 1955 (6), (43–50). [Russ.?] From *abstr.* in *Chem. Zbl.* 127 (18), 1956 (5161). [G.] D.S.I.R.

When stored above water, Hornbeam, Ash and Sycamore Maple wood absorb roughly the same amounts of moisture. When soaked in water, Hornbeam swells less than the other two. Three distinct regions can be distinguished in the swelling %/m.c. curves. Up to 12% m.c. the swelling is linear, from 12 to 46% the curve is convex, and above 46% the wood dimensions remain constant.

2095. IVANOV, YU. [JU.], M. **The swelling pressure of wood.** *Transl. For. Prod. Lab. Can.* No. 102, 1956. pp. 13. Transl. from *Trud. Inst. Les.* No. 9, 1953 (229–35 [*sic*]) [(236–49)]. [See *F.A.* 15 No. 4041.] Limited distribution.

2096. MOSKALEVA, V. E. **Swelling of microsections of natural and compressed Pine wood in liquids of different polarity.** *Transl. For. Prod. Lab., Can.* No. 98, 1956. pp. 6. 4 refs. Transl. from *Trud. Inst. Les.* No. 9, 1953 (121–6). [See *F.A.* 15 No. 4046.] Limited distribution. P.R.

2097. VORREITER, L. Die Holzquellung als Funktion mehrerer veränderlicher Faktoren, insbesondere der Temperatur und der Holzabmessung. **[Swelling of wood as a function of a number of variable factors, in particular of temperature and wood dimensions.]** *Holz Roh- u. Werkstoff* 13 (8), 1955 (301–12). 25 refs. [G.g.] P.R.

Presents graphically the results of measurements of the swelling of Spruce test-pieces 15 mm. thick and 10, 13, 22 or 45 mm. square, in water of 20, 40, 50 or 90° C. In seeking a relationship between (radial and tangential) swelling and the determining factors, a formula was developed for oblique swelling at an angle α to the direction of the growth rings in the test-piece. A number of empirical formulae are also proposed for the dependence of the swelling coefficients on each of the factors: oven-dry density; moisture content; temperature of the swelling medium; and size of the test-piece.

2098. UGOLEV, B. N. O metode izmerenija vnutrennih naprjaženiĭ v drevesine v processe ee atmosfernoĭ suški. **[Method of measuring internal stresses in wood during air drying.]** *Zavodskaja Laboratorija, Moskva* 21 (10), 1955 (1224–9). 6 refs. [Russ.] S.C.R.

The method, developed to minimize the effect of the shrinkage occurring during the test, is based on the assumption that stresses in wood vary roughly in linear proportion with time. A thin section is cut from the board at least 50 cm. from one end, and the transverse surface is immediately divided by ruled lines into a number of 4-mm. strips, the original lengths of which are determined to an accuracy of 0·005 mm. by recording only the difference between the measured length and that of a standard gauge. The strips are then cut from the section in the following sequence: first, last, second, last but one, etc. This reduces to a minimum the danger of relaxation in the remainder of the section. A method is also outlined of determining graphically the elastic deformation in each strip. An identical section cut out of the board simultaneously with the first one is split into strips, each of which is stored in a rubber bag and serves for determining the modulus of elasticity for each strip; it was found that the modulus varies in the same sense as the inner stresses. When applied to air seasoning, the method showed that, in the first stage of seasoning, tensile stresses occur in the surface zones (10–15 mm. deep), while compression stresses occur in the interior. In the second stage of seasoning this is reversed.

2099. JANICZEK, M., and TWAROWSKA, I. Badanie przesiąkliwości solanki przez drewno świerkowe. **[Investigation on the permeability of Spruce wood to brine.]** *Roczn. Nauk leśn.* No. 9, 1954 (139–57). 3 refs. [Pol.pol.russ.e.] P.R.

Service tests on barrels and laboratory tests on specimens in special apparatus gave the following results: (1) clear wood containing outer sapwood is permeable to brine irrespective of the direction of the grain; (2) clear wood from the inner layers of sapwood or from heartwood is impermeable to brine, also irrespective of the direction of the grain; (3) permeability is not appreciably affected by the direction of cut (tangential, radial, oblique) or the growth-ring width; (4) deep bluestain increases permeability to brine. [Cf. *F.A.* 15 No. 657.]

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 1711–13, 1780, 2078, 2093.

2100. BRAZIER, J. D. **Density variation in the timber of *Shorea albida*.** *Emp. For. Rev.* 35 (4), 1956 (404–19). 4 refs.

The Sarawak species *S. albida* forms the Alan, Padang and Bunga forest types and produces lightweight Meranti Bunga timber and heavy Alan timber. Wood specimens, correlated with herbarium material, from 68 trees were taken from the 3 forest types, anatomical features examined and sp. gr. determined. Nominal sp. gr. was plotted against distance from the pith. Results are tabulated. The sp. gr. ranges from 0·28 to 0·80, corresponding to ca. 20 to 57 lb./cu. ft., for seasoned timber, but the % of light and heavy wood differs for the 3 types. 'Juvenile' wood (i.e. timber laid down during early years) is light but increases in sp. gr. with radial growth, while 'adult' wood (i.e. outside the central core) has a uniform density. The size at which the tree lays down heavy adult wood varies greatly. Further research is needed.

812.7. Strength Properties

See also Nos. 1353, 2140–2, 2173–5, 2179, 2182–5, 2192, 2224.

2101. **Studies of properties and testing methods.**

Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55, 1955 (93–4).

The presence of macroscopic compression failures on the face of a beam has been regarded as seriously reducing its strength when tensile stresses are subsequently applied. It has now been demonstrated for several species (conifers and hardwoods) that prior loading to near the ultimate strength in bending (judged by the development of compression failures) does not significantly reduce the ultimate strength when the specimens are reversed. Even two such pre-loadings on opposite faces do not appreciably reduce it, though the modulus of elasticity is reduced and the limit of proportionality raised. The effect of heating on strength and modulus of elasticity in tension || has been studied on specimens from 5 trees each of *Pinus radiata, Pseudotsuga taxifolia, Eucalyptus gigantea* and *E. regnans*. The temperature ranged from 70 to 210° F., and duration from 4 min. to 72 hr. Generally both temperature and duration of preheating had a highly significant effect on strength and modulus of elasticity.

2102. SEKHAR, A. C. Die Abhängigkeit des Dämpfungs- und Rückprallfaktors von der Stützweite, der Probenbreite und Probendicke beim Schlagbiegeversuch mit dem Hatt-Turner-Fallwerk. **[Dependence of the damping and recoil factor on the span, and the width and thickness of the test-piece in the impact-bending test with the Hatt-Turner apparatus.]** *Holz Roh- u. Werkstoff* 13 (9), 1955 (338–44). 4 refs. [G.g.] P.R.

In continuation of previous work [see *F.A.* 16 No. 4517], the author investigates variations in these relationships and presents experimental data tending to confirm a linear relationship (theoretically likely) between height loss, the damping factor, the recoil factor and height loss at first impact, and the span, width and thickness, of the test-piece. The determination of the damping and recoil factors (in non-destructive testing) appears to be superior to the conventional impact test for comparative measurements.

2103. MEADOWS, J. C., JR. **Longitudinal shear in wooden beams.** *For. Prod. J.* 6 (9), 1956 (337–9). 2 refs.

Tests on Southern Pine beams from straight-grained wood free of defects, showed little difference in longitudinal shear strength between solid and laminated 2 × 4-in. beams. Strength was greater in the radial than in the tangential plane. Tests by the standard block method gave a rather poor indication of this property of a beam.

2104. MARKWARDT, L. J., and YOUNGQUIST, W. G. **Tension test methods for wood, wood-base materials, and sandwich constructions.** *Rep. U.S. For. Prod. Lab., Madison* No. 2055, 1956. pp. 25 + 6 photos, 8 dgms., 2 gphs., 5 tbls. 8 refs. P.R.

2105. KUMARASAMY, K., and BURGESS, H. J. **The nailing properties of 72 Malayan timber species.** *Malay. Forester* 19 (4), 1956 (219–26 + 6 photos). 1 ref.

The 5 species with best nailing properties were *Campnosperma wallichii, Dyera costulata, Durio oxleyanus, Parishia* spp. and *Shorea gysbertiana*. The experimental data are tabulated for 72 species in decreasing order of nailability; another table gives results for the common commercial categories (e.g. Light or Dark Red Meranti) which are made up of several species.

813. Wood Chemistry

See also Nos. 2258 *et seq.*

2106. BRASCH, D. J., and WISE, L. E. **The chemistry of New Zealand grown *Pinus radiata*. I. Summative analyses and preliminary studies on the hemicelluloses.** *Tappi* 39 (8; 11), 1956 (581–8; 768 74). 54 refs. P.R.

2107. GAIO, F. VELOSO. A madeira de castanheiro—elementos para a sua valorização tecnológica. **[Chestnut wood—basic data for estimating its technological value.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 65-*D*3, 1956. pp. 7. 6 refs. [Port.] Limited distribution.

Presents the results of chemical analyses of the wood of 3 specimens taken from 15-, 13- and 10-year coppice respectively. The tannin content of the bark was also determined. The results suggest that it might prove economic to pulp Chestnut wood after tannin extraction.

2108. BLAND, D. E. **Advances in the chemistry of Eucalypt woods [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 8, 1954 (146–63). 42 refs.

Reviews recent advances in the chemistry of Eucalypt woods. Analyses have revealed differences in composition between good- and poor-grinding wood. Analyses of the zones of the stem of *E. regnans* have also been made. The composition of a hemicellulose from this wood has been investigated and a 4-*O*-methyl-D-glucuronic acid residue identified. A thiolignin and an alkali lignin have been identified in a sulphate black liquor and two alkali lignins in a soda black liquor. The reactive lignin extracted by methanol has been shown to contain two lignins. Chromatographic resolution of kinos and extractives from woods and barks has shown them to be complex mixtures. Dihydrokaempferol, kaempferol and ellagic acid have been identified in the kino of *E. calophylla*. Ellagic acid is shown by chromatograms to be widely distributed in Eucalypts. *From author's summary.*

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 1325, 2075–6, 2221–2.

2109. LORÅS, V., and LØSCHBRANDT, F. **Gravimetric and absorptiometric determination of lignin in pulp and wood.** *Norsk Skogind.* 10 (11), 1956 (402–13). 29 refs. [E.e.nor.] P.R.

Two methods of gravimetric and two of ultraviolet absorptiometric determination are described and the values obtained by them for sulphate and sulphite pulps and Spruce wood are compared.

2110. BJÖRKMAN, E. **Studies of finely divided wood. Part I. Extraction of lignin with neutral**

solvents. *Svensk PappTidn.* 59 (21), 1956 (477–85). 40 refs. [E.e.sw.g.] P.R.

Discusses previous work on isolation of lignin. Describes a method of obtaining milled wood lignin (m.w.l.), a faintly cream-coloured ash-free powder, by grinding in a Lampén mill and in a vibrational ball-mill, using toluene for dispersion, extraction by aqueous dioxone, dissolving in aqueous acetic acid, precipitation in water, dissolving in $C_6H_4Cl_2$—EtOH, and precipitation in ethyl ether. Describes also the chemical and physical properties of Spruce m.w.l. and concludes that it is close to protolignin (the lignin in fresh wood) and may be very useful in lignin chemistry. Yields of 50–60% were obtained.

2111. YAN, M. M., and PURVES, C. B. **Extraction of a lignin fraction from Maple wood [*Acer saccharum*] by liquid ammonia.** *Canad. J. Chem.* 34 (12), 1956 (1747–55). 17 refs. O.R.S.

2112. DOUGHTY, J. B., TAYLOR, F. W., and HENEREY, W. T. **Alkali and thio lignins from Pine bark.** *For. Prod. J.* 6 (11), 1956 (476–8). 5 refs.

Reports experiments on lignin recovery in a Southern pulp mill by the acidification of the spent liquor from various cooks of mixed Pine bark. The lignin content was greater than that of wood, and the chemical composition somewhat different.

2113. MCKENZIE, A. W., and HIGGINS, H. G. **The reactivity of cellulose. I. The effect of beating and other physical treatments on rate of acetylation.** *Holzforschung, Berlin* 10 (5), 1956 (150–3). 10 refs. [E.e.g.] P.R.

The effects of beating, milling, acid treatment, drying and swelling on the rate of acetylation of Eucalypt α-cellulose were studied. The rheological properties of papers made from treated fibres were found to be related to their chemical reactivity. Paper strength is, however, governed only by the external surface of the fibre, reactivity by the total surface (internal and external) and by the accessibility of the interior. The density of the H bond network appears to be a major underlying factor in the reactivity of cellulose in any solid form. *Authors' summary.*

2114. HÄGGLUND, E., LINDBERG, B., and MCPHERSON, J. **Dimethylsulphoxide, a solvent for hemicelluloses.** *Acta chem. scand.* 10 (7), 1956 (1160–4). 7 refs. [E.e.] O.R.S.

Part of the holocellulose of Birch and Spruce was extracted with CH_3SOCH_3, and a further amount by subsequent water treatment. Extraction was mild, and the fractions still contained a high % of the acetyl and formyl originally present. The extractions caused partial fractionation of the hemicellulose components. CH_3SOCH_3 can also be used as a rather selective precipitating agent for hemicelluloses. *From authors' summary.*

2115. BALL, D. H., *et al.* **The structure of the hemicelluloses of Loblolly Pine.** *Tappi* 39 (6), 1956 (438–43). 19 refs. P.R.

Extraction of *Pinus taeda* sawdust with alkali gave a mixture of hemicelluloses which were fractionated by chemical methods, yielding 4 fractions, the structures of which were determined.

2116. DUTTON, G. G. S., and SMITH, F. **The constitution of the hemicellulose of Western Hemlock (*Tsuga heterophylla*). II. Hydrolysis of the methylated hemicellulose.** *J. Amer. chem. Soc.* 78 (15), 1956 (3744–8). 27 refs. O.R.S. [Cf. *F.A.* 18 No. 927.]

2117. MILKS, J. E., and PURVES, C. B. **Attempted preparation of a homogeneous hemicellulose from Aspen wood.** *J. Amer. chem. Soc.* 78 (15), 1956 (3738–44). 33 refs. O.R.S.

2118. ASPINALL, G. O., and CARTER, M. E. **The constitution of a xylan from Norway Spruce (*Picea excelsa*).** *J. chem. Soc.* Oct., 1956 (3744–8). 11 refs. O.R.S.

813.2. Minor Organic Constituents. Extractives. Cell Contents

2119. Gele kleurstof in doussié-hout. [**A yellow pigment in wood of *Afzelia* sp.**] *Meded. Inst. Trop. Amst.* No. 116 (*Afd. trop. Prod.* No. 45) 1956 (30–1, 67–8). 1 ref. [Du.e.]

A yellow deposit proved to be identical in chemical properties with afzelin. [See *F.A.* 11 No. 2793.]

2120. SAWHNEY, P. L., and SESHADRI, T. R. **Special chemical components of commercial woods and related plant materials: Part IV—Phenolic components of some *Pterocarpus* species.** *J. sci. industr. Res., India* 15*C* (6), 1956 (154–5). 3 refs. D.S.I.R.

P. santalinus and *P. marsupium* were investigated. Liquiritigenin, isoliquiritigenin and pterostilbene were isolated. [Cf. *F.A.* 18 No. 935.]

2121. KING, F. E., *et al.* **The chemistry of extractives from hardwoods. Part XXVIII. The occurrence of 3 : 4 : 3′ : 5′-tetrahydroxy- and 3 : 4 : 5 : 3′ : 5′-pentahydroxy-stilbene in *Vouacapoua* species [*V. macropetala* and *V. americana*].** *J. chem. Soc.* Nov., 1956 (4477–80). 10 refs. O.R.S. [Cf. *F.A.* 17 No. 846.]

813.3. Ash Constituents

See Nos. 2059, 2228–9.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

See No. 2276.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See No. 2187.

813.8. Poisonous and Irritant Properties

2122. SANDERMANN, W. Gesundheitsschädigende Hölzer in der Betriebspraxis. [**Mill work with woods injurious to health.**] *Holz-Zbl.* 82 (112), 1956 (1367–8). 1 ref. [G.]

Lists 43 injurious species with the symptoms they produce, and several that are doubtfully injurious. Stresses the fact that very few are injurious to users of finished products, and most of them only to workers with special susceptibilities. Preventive

measures, e.g. dust control, and protective clothing are discussed.

814. Natural Durability. Old Wood. Fossilized Wood

See Nos. 2081, 2225–6, 2228–9, 2235.

815. Effect of Growth Factors on Structure and Properties

See Nos. 1353, 1780, 2073–4, 2078, 2100.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

2123. HARRIS, P. **Cutting action of tools.** *Research, Lond.* 9 (3), 1956 (109–13). O.R.S.

Discusses the behaviour of wood compared with that of metal when cut. Describes techniques used in studying the influence of various factors on chip formation. Gives information on cutting action observed by stroboscopic, high-speed photographic and other means. Outlines methods of overcoming difficulties with timbers of abrasive nature or with special grain characteristics. *From author's summary.*

2124. LINDNER, J. Neuzeitliche Werkzeuge für die Bearbeitung von Holz und Holzwerkstoffen. **[Modern tools for the machining of wood and wood materials.]** *Holz Roh- u. Werkstoff* 13 (9), 1955 (345–52). 3 refs. [G.g.] P.R.

Discusses the foolproof fixing of cutters in cutter blocks, the maximum chip thickness and the allowable degree of regrinding (resharpening). Different cutter blocks and circular saws are described from the point of view of work safety.

2125. HANMAMEDOV, K. M. **[Effect of impregnation of wood on the blunting of cutting tools.]** *Doklady Akademii Nauk Azerbaidžanskoĭ SSR* 11, 1955 (857–9). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 10 (5), 1956 (157). [G.] P.R.

Investigations on untreated and creosote-treated wood of Beech, Ash and Scots Pine showed that friction during cutting was lower in the impregnated than in the untreated wood. Depending on the direction of the cut, the coefficient of friction decreased by 27–66%, no substantial differences being observed for different species.

821. Barking

See also Nos. 1653, 1669–71.

2126. **The choice of barker for the sawmill.** *For. Prod. J.* 6 (9), 1956 (19*A*-24*A*).

A panel discussion, covering installation, operation, efficiency, maintenance etc., mentioning the Nicholson Mechanical Barker, the Bellingham, the Hansel Ring, the Hansel Oscillating (Wig-wag) and the Simons rotary-head barkers, all except the first hydraulic.

2127. **New-type slab barker.** *Sth. Lumberm.* 193 (2411), 1956 (54).

The new barker (Carthage Machine Co., New York) has 3 hydraulically adjustable heads, equipped with knives welded on steel roller chains which travel across the slab at ca. 1000 ft./min. and remove the bark by scraping rather than flailing. Two men can bark 1·5–2 cords of slabs of a minimum length of 5 ft. and maximum cross-section of 16 × 7 in. in one hour.

2128. LIIRI, O. Verfahren und Maschinen zur Holzentrindung, insbesondere für Sägeblöcke. **[Methods and machines for barking wood, especially for sawlogs.]** *Holz Roh- u. Werkstoff* 13 (8), 1955 (281–91). 7 refs. [G.g.] P.R.

The following machines are described (with illustrations) and evaluated: machines acting on the log-friction principle—Orrmel, Hillbom, and the Waterous Friction Whole Log Barker; rotor-type machines —Andersson, Mira, Sund, Ednell, LMV, Cambio, Skoglund, Söderhamn, Nicholson-Rotobarker, Valo and Nuppo; a knife-cutterblock machine, Veikko; a chain-friction machine, Söderhamn D-3; the Burnt River machine, incorporating gear-tooth rollers and steel brushes; the hydraulically operated Hansel Oscillating Arm machine; and the chain-friction Sjöholm machine for barking wood-waste.

822. Saws and Sawing

See also section 832.1 and Nos. 1652–3, 2149.

2129. HVAMB, G. Skurnøyaktighet ved våre viktigste sagbrukstyper: resultater fra målinger med skrivende instrument. **[Sawing precision in important types of Norwegian sawmills: results of measurements using a recording instrument.]** *Medd. norsk tretekn. Inst.* No. 8, 1956. pp. 13 + 1 photo., 10 dgms. 11 refs. [Nor.e.] P.R.

Measurements were made with a sensitive electrical recording instrument [see *F.A.* 15 No. 4301] at frame, band, and circular sawmills. The one bandsaw studied, which had swage-set teeth, showed the greatest accuracy, with greater accuracy at the middle than at the ends of boards. Both the bandsaw and framesaws showed great uniformity between the top and bottom edges. The framesaw, too, showed greater accuracy in the middle length of the board. Circular saws were less accurate than frame or band saws, accuracy being least at the upper edge of the cut. Tabulated figures show, for each sawmill type, the minimum oversize required to ensure that no boards are undersized. Tables and diagrams illustrate the variations in thickness for planks of different size.

2130. KARL, G. Ein einfacher Gatterindikator zum Selbstbau. **[A simple frame-saw indicator for home construction.]** *Holz-Kurier, Wien* 11 (45), 1956 (5–6). [G.]

Describes and illustrates a simple recording device for feed and saw speeds.

2131. CHARDIN, A. Le stellitage des lames de scies à ruban. **[The stellite tipping of bandsaw blades.]** *Bois For. Trop.* No. 50, 1956 (49–56). 1 ref. [F.e.span.]

Describes a method developed in England for the stellite tipping of bandsaw blades and gives practical advice on the choice and preparation of blades and precautions to be taken.

2132. ANTOINE, R. C., and LALOYAUX, L. E. Le débit des bois à la scie à ruban. 1. Introduction à l'étude du sciage des principaux bois du Congo belge. **[Conversion by bandsaw. I. Introduction to sawing studies of the chief timbers of the Belgian Congo.]** *Publ. Inst. nat. Étude agron. Congo belge (Sér. tech.)* No. 46, 1955. pp. 31. [F.] Price *Fr.*25.

Describes the apparatus and method and justifies the statistical treatment of the data (illustrated from *Chlorophora excelsa*) used in sawing tests, e.g. on this species and on *Terminalia superba, Newtonia leucocarpa, Gilbertiodendron dewevrei* and *Celtis mildbraedii*, each of which will be the subject of a separate publication.

2133. ANTOINE, R. C., and LALOYAUX, L. E. Le débit des bois à la scie à ruban. II. Étude du sciage de *Chlorophora excelsa* (Kambala, Mulundu). **[Conversion by bandsaw. II. Sawing *C. excelsa*.]** *Publ. Inst. nat. Étude agron. Congo belge (Sér. tech.)* No. 47, 1955. pp. 77. [F.]

A detailed study of the best sawing conditions, already outlined for other timbers [see *F.A.* No. 2876]. The timber is easy to saw, with little wear on the blade, though quarter-sawing requires slightly more work than flat sawing. The tooth should have a semicircular gullet, a straight top with a clearance angle of 15° and a pitch of 50 min., with swage setting. The optimum bite for a depth of cut of 0·20 m. is 800μ, the former varying inversely as the latter, e.g. 200μ for 0·80 m.; energy consumption at the saw per 100 sq. cm. cut (*travail spécifique*) is then least, and remains constant if these two factors are unvaried, which does not imply a constant power requirement if, as is desirable, the highest saw speeds are applied. To avoid saw fatigue a bite of 700μ is advised. A chart is appended for those sawyers who require to saw under the best conditions, e.g. with a bite of 800μ with the recommended tooth and a driving wheel of 1·10 m. diameter, from which, starting from the h.p. available, saw speed and feed speed can be read for a series of depths of cut to assure this optimum bite. A second chart is for those for whom the variation of saw speed is inconvenient and who wish in consequence to use a bite less than the optimum. Examples are given of the use of these charts.

2134. CERMAK, F. Le sciage des bois tropicaux en Indonésie. **[The sawing of tropical timbers in Indonesia.]** *Bois. For. Trop.* No. 49, 1956 (35–43). [F.e.span.]

2135. **The influence of working conditions on the circular saw blade of hard metal.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3066, 1956. pp. 11 + 5 photos, 4 dgms., 3 gphs. Transl. by P. U. A. Grossman from *Technische Mitteilung Walter G.m.b.H. Montanwerke, Tübingen*, No. *H*3, 1955. pp. 8. P.R. Limited distribution.

2136. HELGE, K. Undersøkelser av forskjellige typer sirkelsagblad og forholdene under skjæring av harde trefiberplater ved justersagene. **[Studies on different types of circular saw blade and conditions during the cutting of hardboards with trimming saws.]** *Meddelelse fra Papirindustriens Forskningsinstitutt, Oslo* No. 83, 1956. pp. 83. [Nor.e.] P.R.

Discusses the effect on wear and on quality of the cut of such factors as tooth shape, speed of rotation, quality of steel, and use of carbide-tipped teeth. Tests were made at a mill to evaluate performance of different blades from their power consumption, as a function of length of time in use and by visual evaluation of the cut. Results showed however that over an extended period of testing, the variations in board quality were too wide to allow a reasonably accurate evaluation of the relative merits of the blades. *From author's summary.*

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also Nos. 2124, 2140.

2137. GRECHUKHIN [GREČUHIN], A. I. **Determining sharpness of cutting edge of tool by the interference method.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3034, [*n.d.*]. pp. 5 + 2 photos, 1 dgm. Transl. by E. Feigl from *Stanki i Instrument, Moskva* 1952 (23), (32–3). Limited distribution. P.R.

2138. KOCH, P. **An analysis of the lumber planing process. Part II.** *For. Prod. J.* 6 (10), 1956 (393–402). 13 refs.

[For Part I, see *F.A.* 17 No. 866.] Reports on six tests dealing with various combinations of cutting-circle diameter, number of knives, depth of cut, feed speed, angle between rotational axis of cutterhead and direction of feed, up-milling *vs.* down-milling, width of head, knife extension beyond face of gib, moisture content and specific gravity.

2139. HAASE, F. Die Ziehklingenmaschine und ihr Einsatz in der Massenfertigung. **[The scraper and its role in mass production.]** *Holz Roh- u. Werkstoff* 13 (10), 1955 (384–8). [G.g.] P.R.

Illustrated description of a German-made scraper.

824. Forms of Joint. Jointing and Assembly

824.4. Dowelled Joints

2140. HOYLE, R. J. **The effect of boring speed and feed rate on the strength of glued dowel joints in tension.** *For. Prod. J.* 6 (10), 1956 (387–92). 1 ref.

Specimen holes were bored in *Acer saccharum, Quercus borealis* and *Pinus strobus* blocks at 1620, 2880 and 4430 revs./min., at feed rates producing chips from $\frac{1}{128}$ to $\frac{1}{16}$ in. thick. All dowels were of *Betula lutea.* The adverse effect of large chips on the smoothness of the wall and hence on the bond, was greatest in the Pine and least in the Maple, and is thought to be connected with the density and uniformity of the wood. For all woods, the effect of revs./min. was greater than that of feed rate, the medium speed giving the best results. The rapid generation of heat at high speeds, and long exposure to lower temperatures at low speeds, are both thought to cause overheating of the wood surface, which weakens the bond, presumably owing to its effect on the polarity of the wood. Some recommendations on tool design are given.

824.8. Glues and Gluing

See also Nos. 2047, 2175.

2141. ZENKTELER, M., and GRZECZYŃSKI, T. Czynniki wpływające na wynik badania wytrzymałości połączeń klejowych. **[Factors affecting the results of strength tests of glue joints.]** *Przem. Drzewny* 7 (3), 1956 (76–7). [Pol.] P.R.

[Cf. *F.A.* 18 No. 962.] Discusses the effect of the type of test-piece, direction of the stress, wood species, moisture content, etc.

2142. KNIGHT, R. A. G. **The efficiency of adhesives for wood.** *Bull. For. Prod. Res., Lond.* No. 38, 1956. pp. 17 + 5 photos. Price 2*s.* 6*d.*

Accounts are given of 4 series of tests on glues for plywood manufacture and 5 with glues for assembly work. Each section contains descriptions of the test unit, exposure environments and the method of analysing observations, together with the results. A table presents all the data from experiments of 5 years' duration or longer. *From author's summary.*

2143. CHUDZIŃSKI, Z. Charakterystyka klejów stosowanych w przemyśle sklejkowym. **[Characteristics of glues used in the plywood industry.]** *Roczn. Nauk leśn.* No. 9, 1954 (87–103 + 12 gphs.). [Pol.russ.e.] P.R.

Presents in tables and graphs the results of investigations on glue-line strength, carried out in Polish plywood factories in 1945–52 with the following glues; (*A*) phenol-formaldehyde 'Alpit'; (*B*) cresol-formaldehyde 'Krezolit'; (*C*) phenol-formaldehyde with filler, 'Neo-Alpit'; (*D*) casein; (*E*) blood; (*F*) albumin; and (*G*) mixed albumin/casein. The synthetic glues were tested both dry and after boiling for 6 hours in water; animal glues were tested only in dry condition. The dry shear strength was found to be equal for *A*, *B* and *C*; the highest water resistance was found in *B*, the lowest in *C*; the shear strength of glue lines of animal glues decreased in the order *G*, *D*, *E*, *F*.

2144. **Durability of water-resistant woodworking glues.** *Rep. U.S. For. Prod. Lab., Madison* No. 1530 (rev.) 1956. pp. 19 + 4 tbls., 17 gphs. 5 refs. P.R.

Previous editions published in 1944 and 1946 as 'Summary of information on the durability of aircraft glues'.

2145. CONNELLY, H. H. **Glues for cold bonding.** *Veneers & Plyw.* 49 (2), 1955 (12, 31). P.R.

Describes the properties of the cold-bonding resorcinol-phenol resin glue and tabulates the open-assembly and cold-assembly times for temperatures between 70 and 100° F.

2146. KULL, W. **The heating of parallel-faced materials between heating platens and the determination of the heating time for gluing of wood, especially for the production of chip boards.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2866, 1956. pp. 13 + 1 dgm., 13 gphs. Transl. by E. Feigl from *Holz Roh- u. Werkstoff* 12 (11), 1954 (413–8). [See *F.A.* 16 No. 3435.] P.R.

2147. HYLER, J. E. **Glues and gluing. Parts 93–97.** *Sth. Lumberm.* 193 (2412–2415), 1956 (61 . . . 64; 63 . . . 66; 53 . . . 56; 41 . . . 44; 33 . . . 40).

Clamping machines, glue guns, joints, assemblies etc.

825. Cleaving. Adzing. Mechanical Comminution

See Nos. 1680–1.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See also Nos. 2166–9.

2148. MURPHEY, W. K., and SCHNEIDER, G. D. **Greater utilization of material obtained from new [wood-slicing] machine.** *For. Prod. J.* 6 (9), 1956 (319–20).

Describes a machine developed by the second author for doing the work of a re-saw by slicing, so avoiding kerf losses. The slicing is done by a set of annular knives, separated by spacer rings, mounted on a roller along with side pressure plates (one at each end of the knife assembly) to prevent cleavage in advance of the actual cut. The material to be sliced is fed into a pair of such rollers, one cutting into the upper, the other into the lower face of the lumber. Each cut is ca. $\frac{1}{4}$ in. deep, so that to slice through 1-in. lumber two pairs of rollers are required, one pair slicing the first $\frac{1}{4}$ in. into each face, and the next pair completing the cut. The rollers both cut and feed the lumber, no extra feed rollers being required. Many species, from kiln-dried Hard Maple to kiln-dried Basswood, have been sliced in this way. Surface wood compressed by knife action is removed, if necessary, by planing. [Cf. *F.A.* 17 p. 614.]

2149. **New 'Long-Kut' saw cuts large sheets of material.** *Veneers & Plyw.* 50 (1), 1956 (39). P.R.

Illustrated description of a new circular saw which, along with its electric motor, can be moved along a carrying ledge below which the material to be cut (plywood, plastic and other non-metallic materials) is placed.

2150. GUNNASON, J. **Guide line lights and accuracy.** *Veneers & Plyw.* 49 (3), 1955 (18–20). P.R.

Guide-line lights are now used in the veneer and plywood industry. The lamps must be free from vibrations. They project either a thin light strip or a thin shadow indicating the place of cut.

827. Bending. Moulding (other than by Cutting)

See also No. 2178.

2151. REHMAN, M. A., KISHEN, J., and KUKRETI, D. P. **The steam bending properties of Indian timbers.** *Indian For.* 82 (9), 1956 (469–78). 25 refs.

The results of a first series of tests on steam bending of 19 Indian timbers are described and the data tabulated. *Lagerstroemia lanceolata* and *Dalbergia latifolia* were found to be best. *Ulmus* spp. and *Quercus semecarpifolia* were also good but are available only in small quantities.

829.1. Finishing

See also No. 2139.

2152. **List of publications on wood finishing subjects.** *Rep. U.S. For. Prod. Lab., Madison* No. 454, 1956. pp. 19. P.R.

2153. HAYES, R. W. **Natural finishes for wood used on exteriors of buildings.** *LSU For. Note. La. agric. Exp. Sta.* No. 6, 1955. pp. 2.

Of 8 'natural' finishes tested by exposure on wood panels for 12 months, only two gave satisfactory results, and the better of these was a 'fortified log oil' obtained by adding 2 lb. normal Pb salicylate/gal. polymerized linseed oil. This was rated excellent in appearance, finish, and resistance to mildew on all 3 species tested (*Pinus taeda*, *Taxodium distichum* and *Pseudotsuga taxifolia*).

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

See also Nos. 2039–40.

2154. **List of publications on logging, milling, and utilization of timber products.** *Rep. U.S. For. Prod. Lab., Madison* No. 790, 1956. pp. 22. P.R.

Lists publications (since ca. 1930) presenting the results of Madison research on methods in wood-producing and wood-consuming industries; standard lumber grades, sizes and nomenclature; production and use of small dimension stock; specifications for small wooden products; utilization of little-used species and commercial woods; and low-grade wood and wood-waste surveys.

831. Fuelwood and Various Types of Rough Timber

See also Nos. 2023, 2211–4.

2155. BINDSEIL, G. Strobenholz für Imkerzwecke. [**The use of *Pinus strobus* in bee-keeping.**] *Holz-Zbl.* 82 (153), 1956 (1821). [G.]

The wood of *P. strobus* is considered particularly suitable for bee-hives because of its thermal and acoustic qualities, its stability, durability, ease of working, and lightness.

832. Mills, Their Functions and Products

2156. HRIPUŠIN, Z. V. Universaljnaja eksgausternaja ustanovka. [**Universal dust-exhausting equipment.**] *Derev. Prom.* 4 (3), 1955 (24–5). [Russ.] P.O.

Illustration, description, and discussion of the merits of a new exhaust plant designed by Šemjakin for wood-working factories.

2157. KHRIPUSHIN [HRIPUŠIN], Z. V. **Universal dust exhausting equipment.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2968, 1956. pp. 3 + 3 dgms. Transl. by E. Feigl from *Derev. Prom.* 4 (3), 1955 (24–5). [See preceding abstr.] P.R.

832.1. Sawmills and Planing Mills

See also Nos. 2129–39, 2247.

2158. HYLER, J. E. **Modern sawmilling. Parts 54–58.** *Sth. Lumberm.* 193 (2412–2415), 1956 (39 . . . 48; 37 . . . 44; 35 . . . 38; 51 . . . 58; 41 . . . 44).

Bandmills, power, steam, etc.

2159. **Tasman, the largest sawmill in the southern hemisphere.** *Suppl.* to *Aust. Timb. J.* 22 (9), 1956. pp. 40.

A profusely illustrated account of the sawmill of the Tasman Pulp and Paper Co. at Kaweru, New Zealand, covering origin and structure of the company, mill-flow plan, sawing, processing, and handling equipment and logging. The annual output is to be 72,000,000 super feet (2 shifts). Timber is drawn from Kaingaroa. [Cf. *F.A.* 16 No. 4445; 17 No. 762; 18 No. 2328.]

2160. MATER, H. M. **Power requirements for sawing Redwood cants with seven-foot diameter bandmill.** *For. Prod. J.* 6 (10), 1956 (408–10).

Analyses curves of ampères consumed by the bandmill versus time in the cut at different speeds, and effect of knots on power requirements, and calculates the power required per cu. in. removed at different speeds (average 98·3 ft.-lb.).

2161. **Mechanical handling in saw mills.** *For. Equipm. Note, FAO* No. *D*.10.56, 1956. pp. 12.

Notes on portal (gantry) and overhead travelling cranes, elevated cableway [skyline] cranes and cables, monorails, cranes, winches, and conveyor chains and, in more detail, the lay-out and operation of conveyor systems.

2162. JOHNSON, F. A. **Specifications for processing mill scale study data on a type 650 electronic machine.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 133, 1956. pp. 10.

In April 1956, boards from 500 White Fir and Western Hemlock were measured at a lumber mill and a magnetic drum data-processing machine (type 650) was used to calculate the bd. ft. volume by lumber grade, the overrun % for each log, and the mean bd. ft. volumes for each log diam. class within log grades and species. The linear relationship between lumber-grade volume and net log scale was later exploited to show curves of lumber grade in % of net log scale over log diameter. The basic data required for the process are specified, and operating instructions and sample specifications of data for punched cards are given.

2163. GRAF, J. Grosssägeleistung im Fliessbandverfahren mit Graf-sägen. [**High sawing output by 'conveyor-belt methods' with Graf saws.**] *Allg. Forstztg.* 66 (7/8), 1955 (102). [G.]

A description by the inventor of his all-steel portable circular saw. It is mounted on a carriage running on rails, which carries the operator. It can saw backwards and forwards. Model Grafeins (cost ca. Sch. 5000) can slab and cut logs up to 60 cm. in diam. Model Sägeautomat (price ca. Sch. 10,000) saws boards up to 25 cm. in width, 1 or 3 at a time, moving from cut to cut by swift hand adjustment. Model 1 can also be fitted with 3 blades, but boards have to be removed by hand. Power required is 14–17 h.p.

2164. **Stenner portable bush mill.** *Timb. Tr. J.* 219 (4183), 1956 (94).

Describes a 120-h.p. electric double circular-saw mill for logs 20 ft. long and 45 in. diameter, mounted on 3 trailers which are bedded on the ground, after removing the wheels, by incorporated jacks. Diesel alternator sets supply the electricity. The mill is designed by Stenners of Tiverton in collaboration with Steel Bros. (Tanganyika Timbers) Ltd.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 2047, 2089, 2103–4, 2141 *et seq.*, 2187, 2190–1, 2194–5, 2254–5.

2165. KOLLMANN, F., and SCHULTE-BRADER, H.-J. **Study of the recovery of the German plywood industry.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2837, 1956. pp. 15 + 2 dgms., 2 gphs. 5 refs. Transl. by E. Feigl from *Holz Roh- u. Werkstoff* 12 (12), 1954 (465–71). [See *F.A.* 16 No. 3461.] P.R.

2166. LUTZ, J. F. **Effect of wood-structure orientation on smoothness of knife-cut veneers.** *For. Prod. J.* 6 (11), 1956 (464–8). 11 refs.

Discusses and illustrates the effect of the orientation of fibres, annual rings, and rays in both slicing and rotary cutting, and suggests practical methods of sawing and mounting bolts and flitches for best results. *From author's summary.*

2167. FEIHL, A. O. **White Elm veneer and plywood.** *Timber of Canada* 17 (9), 1956 (95–7). 2 refs.

A study of *Ulmus americana* on the lines already reported for Birch [see *F.A.* 17 No. 4465]. The optimum lathe settings for various thicknesses, knife angles (for bolt diameters of 24 and 6 in.), and horizontal and vertical opening of pressure bar for $\frac{1}{24}$-in. rotary- or stay-log-cut veneer and for $\frac{1}{10}$- and $\frac{1}{8}$-in. rotary-cut veneer, are tabulated. Prolonged hot soaking of the bolts is not recommended; peeling should be done as soon as 140° F. is reached. The species is satisfactory in peeling, drying, gluing and appearance.

2168. FEIHL, A. O. **White Spruce veneer and plywood.** *B.C. Lumberm.* 40 (11), 1956 (64, 68).

Includes a table showing optimum lathe settings and knife angles for 24- and 6-in.-diam. bolts, to cut veneers of $\frac{1}{16}$, $\frac{1}{10}$, $\frac{1}{8}$ and $\frac{1}{4}$ in. thickness.

2169. PERRY, D. **Rotary veneer has a memory.** *Veneers & Plyw.* 50 (1), 1956 (12, 21). P.R.

Rotary-cut veneer tends to preserve its original curved shape; this tendency can be reduced by properly adjusting the pressure bar. Some manufacturers pass the veneer between rollers fitted with sharp points which produce incisions along the grain on either face. The best method is to arrange the cross-bandings in plywood manufacture so as to have their respective stresses mutually compensated.

2170. FECHT, P. Das Trocknen grossflächiger Deckblattschälfurniere. **[Drying of large sheets of rotary-cut face veneer.]** *Holz Roh- u. Werkstoff* 13 (10), 1955 (372–5). 4 refs. [G.g.] P.R.

Illustrated description of the proper handling of large veneer sheets to prevent their splitting, in particular by using special strips to protect the end-grain edges during and after drying.

2171. PLATO, F. VON. Kontrollinstrumente zur Betriebsüberwachung in der Sperrholzindustrie. **[Instruments for production control in the plywood industry.]** *Holz Roh- u. Werkstoff* 13 (8), 1955 (312–3). [G.g.] P.R.

The author considers that manufacturers of plywood-industry machines should supply these machines with (or at least quote for) measuring instruments enabling the user to control the work output and conditions of manufacture.

2172. **Estimating the weight of plywood.** *Tech. Nóte U.S. For. Prod. Lab., Madison* No. 260, 1956. pp. 4. P.R.

Contains a table giving the weight of 1000 sq. ft. of veneer, based on the weight and volume at a moisture content of 8%, for 32 American broadleaved and 11 American coniferous species.

2173. MARKWARDT, L. J. **Approximate methods of calculating the strength of plywood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1630, 1956. pp. 1 + 3 tbls. P.R.

Presents recommended methods of calculating the strength and stiffness of plywood, and suggested working stresses for the design of Douglas-Fir plywood based on the laboratory's tests. These methods are an abridged and simplified form of the more elaborate mathematical formulae that have been developed.

2174. FREAS, A. D. **The bending strength and stiffness of plywood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1304 (rev.) 1956. pp. 31 + 4 photos, 2 gphs., 18 tbls. 12 refs. P.R.

A more comprehensive report on tests described in 1946. [See *F.A.* 9 No. 1010.]

2175. PLATH, E. Die Beurteilung der Leimbindefestigkeit von Sperrholz: ein mathematisch-statistischer Beitrag zur Neufassung der Gütebestimmungen von Sperrholz. **[Assessment of glue-bond strength in plywood: a mathematical-statistical contribution to new grading rules for plywood.]** Forschungsinstitut für Holzwerkstoffe und Holzleime, Karlsruhe. 1956. pp. 53. [G.] X.

Analyses the American, the British, and the existing and suggested German methods of assessment; describes a proposed programme of tests, and discusses the statistical evaluation of such tests; in conclusion the author discusses the effect of test-piece shape and other factors on the results.

2176. **Slotting lumber to reduce warping.** *Veneers & Plyw.* 50 (5), 1956 (28). P.R.

Suggests using this method in coreboards. The slots are cut by saw, leaving ca. $\frac{1}{16}$ in. of solid stock. The resulting coreboard, after the veneers are glued in place, is of 'stressed-skin' construction. The slots are usually parallel, 3–4 in. apart.

2177. **Automation and quality control yield Novoply in the largest plant of its kind in the world.** *Timberman* 58 (1), 1956 (105 . . . 112).

A detailed, illustrated description of the manufacture and the product (an all-wood panel in 3-ply with the outer faces made of resin-impregnated veneer flakes fused to a lower-density core of medium-sized, resin-treated chips).

2178. FINNORN, W. J., and RAPAVI, A. **Safe bending radii for curved laminates.** *For. Prod. J.* 6 (10), 1956 (437–42). 10 refs.

In connexion with the U.S. Navy's ship-building programme, tests were carried out on various species, using, except for the interlocked grain inherent in Mahogany, clear straight-grained specimens. Empirical formulae relating safe bending radii (R_s) to thicknesses between $\frac{1}{4}$ in. and 1 in. (t) were evolved for White Oak ($R_s = 116t-6$), Douglas Fir ($R_s = 126t + 10$), and African Mahogany ($R_s = 124t + 10$). Red Oak (treated with Tanalith or PCP) had greatest bending capacity, followed by White Oak, African and Honduras Mahogany, Philippine Mahogany and Douglas Fir. Moisture content between 9 and 12%, and intraspecific variations in specific gravity had no significant influence. [Cf. *F.A.* 14 No. 2736.]

2179. FOX, S. P. **An investigation into the effects of certain variables in scarf-jointed timber laminations.** *For. Prod. J.* 6 (10), 1956 (428–37). 6 refs.

In tensile tests on 950 Douglas Fir specimens, differences in cross-sectional area, adjustment of m.c. values, and adhesive used had little or no significant effect on strength. A non-linear relationship was found between strength ratio and the depth of the notch created by the end step of scarf joints.

833. Timber in Buildings and Engineering Structures (Manufacture and Use).

See also Nos. 2215–6.

2180. TAMWORTH, I. P. **The correct design and utilization of timber in buildings.** *Malay. Forester* 19 (4), 1956 (202-9).

A further section of a new chapter for the revision of *Malay. For. Rec.* No. 13, 'Timber utilisation in Malaya'. [Cf. *F.A.* 18 No. 838.]

833.1. Building Components and Fittings: General

See also No. 2103.

2181. CHURCHMAN, H. **Lamella. Part three.** *Wood* 21 (10), 1956 (388–9).

Setting out, cutting and machining. [Cf. *F.A.* 18 No. 1021.]

2182. MACDONALD, K. R. **Earthquake test of wood structures.** *Veneers & Plyw.* 50 (5), 1956 (10–1, 16, 18–21). P.R.

Describes a hydraulic plant with instruments used for measuring the resistance of building structures and constructional elements (containing plywood in flooring, walls, and roof covering) to gusts of wind up to 220 km./hour.

2183. BURROWS, C. H., and JOHNSON, J. W. **Lateral test on full-scale roof diaphragm with diamond-pattern sheathing.** *Rep. Ore. For. Prod. Lab.* No. *T*-18, 1956. pp. 10 + 10 photos, 2 gphs. P.R.

Tabulated and graphed results show the strength and stiffness of this pattern compared with other sheathing arrangements.

2184. JOHNSON, J. W., and BURROWS, C. H. **Lateral test on full-scale gable roofs with lumber sheathing.** *Rep. Ore. For. Prod. Lab.* No. *T*-19, 1956. pp. 8 + 12 photos, 2 dgms., 3 gphs., 8 tbls. P.R.

A gable roof with diamond-pattern sheathing was shown to be 10–15% stronger than one with herringbone sheathing. Both gable roofs were considerably stronger than most flat-roof diaphragms tested previously, but were weaker than flat roofs having reinforced boundary members.

2185. HOFSTRAND, A. D. **Racking tests on wood wall sections with mullions.** *Rep. Ore. For. Prod. Lab.* No. *T*-17, 1956. pp. 15 + 6 photos, 1 dgm., 7 gphs. P.R.

Results of tests on 8 full-scale wall sections with vertical mullions between windows, indicated that efficiency of the wood wall in imparting stiffness to the mullion increased as height of the wall section decreased. The effectiveness of increased size of mullion was demonstrated.

833.2. Special Uses in Residential, Commercial and Public Buildings

2186. CAMPBELL, P. W. E. **Timber buildings in Malaya.** *Malay. Forester* 19 (4), 1956 (209–14).

Discusses the advantages of timber, the traditional material for house building in Malaya. Timber houses look better, cost less, and are more comfortable and healthy to live in.

833.3. Special Uses in Factories and Workplaces

2187. BAECHLER, R. H. **Chemical engineering reviews. Materials of construction. Wood.** *Industr. Engng. Chem.* 48 (9), 1956 (1798–1801). 97 refs. P.R.

Covers developments in wood products during the period April 1954 to April 1956, with particular reference to preservatives and protective treatment, fire-retardant treatments, effect of heat, dimensional stabilization, and glued wood products.

2188. **Cooling towers.** *Aust. Timb. J.* 22 (7), 1956 (721 . . . 734).

Describes the construction of towers, the manufacture of their wooden components and the very exacting conditions which these have to withstand in installations of the Electricity Commissions of Victoria and New South Wales. *Sequoia sempervirens* is the favoured species. Limited use has been made of Bollywood [*Litsea* spp.] and Tallow-wood [*Eucalyptus microcorys*], and pressure-treated clear Radiata Pine is making a bid to enter the market.

833.8. Wood in Hydraulic, River and Marine Uses

See also No. 2191.

2189. JACHOWSKI, R. A. **Factors affecting the economic life of timber in coastal structures.** *Technical*

Memorandum, Beach Erosion Board, Corps of Engineers, Department of the Army [*Washington*] No. 66, 1955. pp. 13 + 5 + 5. 13 refs. P.R.

Summarized information on preservative treatment, handling and construction.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also Nos. 2041, 2099, 2218.

2190. **Plywoods fish story.** *Veneers & Plyw.* 50 (2), 1956 (32–3, 36). P.R.

Illustrated description of a 7·7 × 1·4 × 1·4-m. tank made of water-resistant plywood reinforced with glass laminate (no metal joints; glue being used throughout), used for conveying (mostly under water and over hundreds of miles in the Pacific) fish catches for an aquarium.

2191. PARCZEWSKI, A., and PIOTROWSKI, S. Rury sklejkowe. [**Plywood pipes.**] *Przem. Drzewny* 7 (3), 1956 (73–5). [Pol.] P.R.

Illustrated description of plywood pipes as manufactured in the U.S.S.R. in accordance with the Soviet Standard GOST 7017–54.

2192. **Test for shipping containers in revolving hexagonal drum box-testing machines.** *Rep. U.S. For. Prod. Lab., Madison* No. 1462 (rev.) 1956. pp. 4 + 2 photos, 5 dgms. P.R.

Illustrated description of the scope of the test, and apparatus and test procedures.

2193. **Suitability of short lumber for pallets.** *Rep. U.S. For. Prod. Lab., Madison* No. 2062, 1956. pp. 7 + 3 photos, 2 dgms., 7 tbls. P.R.

Results of tests show that, in general, pallets with butt-jointed intermediate deck boards compared favourably with those made with unjointed ones—suggesting an opening for the use of short-length lumber.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

2194. PERRY, T. D. **Plywood cutting-blocks.** *Wood* 21 (11), 1956 (426–9).

Describes, with examples, the use and mode of operation of the blocks for cutting shapes in paper, card, rubber etc. and gives the specifications and method of manufacture of the special plywood used. *Acer saccharum* veneer is preferred in the U.S.A.

838. Vehicles (including Ships, Boats, Aircraft)

See also No. 2178.

2195. WNUK, M., and GRAJ, L. Możliwości zużytkowania odpadów fornirowych do produkcji kół wozowych. [**Possibility of using veneer waste for the manufacture of cart wheels.**] *Przem. Drzewny* 7 (4), 1956 (120–2). 2 refs. [Pol.] P.R.

[Cf. *F.A.* 17 Nos. 4507, 4577.] The Section of Wood Materials of the Poznan Institute of Wood Technology has worked out a method of making cart wheels from veneer waste in special moulds.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 1515, 1521, 2127–8, 2156–7, 2195, 2281.

2196. [**Spontaneous ignition of sawdust heaps.**] *Sth. Lumberm.* 193 (2411), 1956 (62).

Summarizes a recent study which showed that fires appeared to be most common in heaps > 20 ft. high. A temperature of 135–180° F. indicated danger of rapid subsequent heating to ignition point. Hazard was lessened if heaps had flat tops and gently sloping sides, if coarse and fine materials were well mixed, and if penetration of air was reduced, e.g. by compacting, with or without damping. Steam was more effective than water for fire control, but to put fires out completely, the burning sawdust had to be dug out.

2197. CORDER, S. E., MORRIS, C. O., and ATHERTON, G. H. **Suspension-drying of sawdust.** *Repr.* from *Mechanical Engineering, Easton, Pa.* [78] July, 1956. pp. 3. P.R.

Illustrated description of an apparatus in which sawdust is dried in a stream of hot air which conveys the sawdust upward through a drying duct 3⅛ in. in diam. and 45 ft. high. At the top of the duct the sawdust is separated from evaporated moisture and cooled gases in a cyclone separator. Maximum efficiencies of 70–80% were obtained in this drier. Suspension drying is a practical and efficient method of drying sawdust.

2198. STANISŁAWSKI, A. Brykietowanie trocin bez użycia środków wiążących (Nowa metoda—próby i badania). Część II. [**Briquetting of sawdust without binders (A new method—tests and investigations). Part II.**] *Roczn. Nauk leśn.* No. 7, 1954 (91–126). 11 refs. [Pol.pol.russ.e.] P.R.

[For Part I see *F.A.* 14 No. 2755.] Illustrated description of a continuous-operation briquetting machine developed by Szymanowski. A charge of sawdust is forced into a long tube where it is first heated, then cooled, and the resulting briquette finally discharged. The machine was found suitable for making both light and dark briquettes, using as raw material sawdust even up to 105% m.c., or planings. Tests have shown that dark briquettes can be used in gas-producers and light briquettes in fibreboard manufacture or as raw material for yeast cultures on hydrolysed wood material.

2199. Brikettierung von Holzabfällen mit optimaler Heizleistung. [**Briquetting of wood waste resulting in optimum heating performance.**] *Holz-Kurier, Wien* 11 (37), 1956 (4). [G.]

Describes the Hildebrand Compress HD 100, a small press producing 150–200 briquettes/hour without binder, reducing space to ca. ⅛ of that originally taken up by the sawdust, shavings etc. used. The hardness of the briquettes is that of soft coal; they are suitable for burning in normal stoves or furnaces.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 1729, 2125, 2187, 2189, 2230.

2200. PRICE, E. A. S., and COOK, C. D. **Recent developments in the evaluation of the permanence and toxicity of wood preservatives. [With discussion.]** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (107–36).

Discusses some points associated with studies of toxicity and its persistence which seem to require clarification and better definition, viz. the choice of test fungi, isolation and identification of new and economic fungi, problems of handling and interpretation of insect damage, interpretation of toxicity data, factors affecting permanence, and correlation of laboratory tests with field trials.

2201. MURPHEY, M. **Toxicity of certain wood preservatives to the honeybee.** *Abstr.* in *Proceedings, 51st Annual Convention, Association of Southern Agricultural Workers, Dallas 1954*, 1954 (108–9). C.G.B.

In laboratory and field tests on 9 preservatives, preservatives derived from coal-tar were found the most toxic. Mortality decreased with length of air-drying time. Zn naphthenate, PCP and Cu naphthenate proved satisfactory for treating beehives.

2202. NICOLLE, J., and BRESSY, O. Dosage colorimétrique du bore dans le bois de limba (*Terminalia superba*) traité en vue de la préservation contre les *Lyctus*. **[Colorimetric measurement of boron in *T. superba* wood treated to preserve it against *Lyctus*.]** *Note tech. Centre tech. for. trop.* No. 1, [1956]. pp. 3. [F.]

Colorimetric testing, using chromotrope 2B after 2 hours' extraction in boiling water, gave excellent results in measuring the H_3BO_3 content of treated wood.

2203. SMITH, F. G., *et al.* **A new method for long term preservation of wood by chemical modification.** *For. Prod. J.* 6 (9), 1956 (340–5).

Wood or other cellulosic material is treated with Cu formate in aqueous solution by a vacuum-pressure process and subsequently heated by autoclaving or otherwise (e.g. steam). It is believed that when the reaction is complete, Cu is involved in a cross-linking between adjacent cellulose molecules and permanently fixed into the wood. The new complex formed does not readily leach out in water, in dilute ammonia or in various chelating agents. Tests in sea water and in soil showed high resistance to wood-destroying organisms, with total inhibition points of 0·15–0·20% Cu for marine borers and ca. 0·25% for fungal attack. Leaching experiments with panels having an initial Cu content of 0·6% indicate that effective protection is likely to last > 20 years. Pilot tests with poles and sleepers of various woods, using a 0·8% aqueous solution, showed excellent penetration of sapwood but not of all heartwoods. No reduction of strength properties or electrical resistivity occurred, and the treated wood, which is odourless, non-toxic and slightly darker than untreated wood, can be painted, laminated or glued [cf. *F.A.* 17 p. 614 (Sweden)]. Tests with papers made from treated chips by kraft or sulphite processes showed them to be highly resistant to mildew. The process is known as NCG (the registered trademark of National Cylinder Gas Co., Chicago).

2204. BULMAN, R. A. **The development and use of naphthenates for timber preservation [with discussion].** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (36–63). 49 refs.

Describes the manufacture of metal naphthenates, the organic solvents (C_6H_6 and petroleum distillates) and methods of application used, their properties, their toxicity to fungi, insects and marine borers, specifications in different countries, and types of structures treated.

2205. GRINDELL, P. **Pressure creosoting and the requirements for treating practice [with discussion].** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (85–106).

Discusses various aspects of the practice of pressure creosoting, viz.: the timber and its preparation; the treating medium; the impregnating plant; the treatment itself; and the installation of the treated material.

2206. COUDREAU, J. Installations pour l'imprégnation sous pression du bois en Afrique tropicale. **[Pressure impregnation plants in tropical Africa.]** *Bois For. Trop.* No. 50, 1956 (21–34). 3 refs. [F.e.span.]

Describes the equipment and working of pressure-impregnation plants in the Gold Coast, Nigeria and the Belgian Congo, including a pilot plant for testing the Lebacq process on sleepers.

2207. HUDSON, M. S., and HENRIKSSON, S. T. **The oscillating pressure method of wood impregnation.** *For. Prod. J.* 6 (10), 1956 (381–6). 13 refs.

A description of the method and of the theory on which it is based, with tabulated test results comparing it with full-cell methods for Spruce and Pine in varying stages of seasoning, and specimen treatment schedules. It gave better penetration and retention, especially with green wood [cf. *F.A.* 16 No. 1083]. Commercial results and costs are given for the treating plant at Skelleftehamn, Sweden.

2208. TAMBLYN, N. **Preservative treatment of building timbers by a simplified process.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 223, 1956 (1–2).

Green sawn timber of scantling size is dipped for a moment in a highly concentrated cold solution containing B and F compounds. The addition of As and Cr compounds to increase toxicity is recommended. This treatment is suitable for protected building timbers, but where leaching is likely a second treatment with a Cu or other heavy-metal salt should be given.

2209. BROWNE, F. G. **A note on the use of sodium pentachlorphenate dips.** *Malay. Forester* 19 (3; 4), 1956 (161–4; 235).

Describes the standard dip (1 lb. Na salt of PCP (neutral), 5 lb. BHC water-miscible powder, 2 lb. borax, 10 gal. water) and standard regulations for its use, with special reference to safety precautions in Sarawak.

2210. ALLEN, R. G. VAN. **A new method of applying pentachlorophenol to wood in place.** *For. Prod. J.* 6 (10), 1956 (374–81). 10 refs.

Describes and tabulates test results with a patented PCP/petroleum viscous emulsion [see *F.A.* 17 No. 2104] on Red Cedar and Yellow Pine power-line pole butts and 2 × 8-in. Fir and Pine blocks. The emulsion, which can be laid on with brush or trowel or mechanically, breaks down at a rate in keeping with the absorption of the preservative by the wood, thus acting as a reservoir, while an outer coating is formed which makes wrapping unnecessary. The tests gave uniform good penetration superior to 5% PCP solutions.

2211. RENNERFELT, E., and NYBERG, J. Nachimprägnierung von Schwellen. [**After-treatment of railway sleepers.**] Allgemeine Holzimprägnierung Dr. Wolman G.m.b.H., Sinzheim. [1955]. pp. 12. [G.] Transl. from *Järnvägs-Teknik* No. 1, 1955. I.M.I.

Following trials with Wolman salts in Germany, which are briefly discussed, experiments were started in Sweden to treat *in situ* untreated Pine sleepers that had been in service from 5 to 10 years (the life of such sleepers being ca. 11 years) using (*a*) Wolman and (*b*) Boliden salts, and (*c*) a PCP preparation, in the form of cartridges in boreholes (16 per sleeper) or as a paste, both applied close to the rails, at a total dosage of ca. 200 g./sleeper or 4 kg./cu.m. Moisture content of the sleepers varied between 50 and 109% for sapwood (s.w.) and 31 and 47% for heartwood (h.w.), attaining 140% in rotten s.w. Three months after treatment, some sleepers were cut into 8 sections and analysed chemically. Penetration for (*a*) and (*b*) was quite good, better in the s.w. and lengthwise than in the h.w. or radially, but knots, splits or rotten parts tended to prevent penetration. PCP did not spread satisfactorily. In laboratory tests on blocks cut from the sleepers, and exposed for 3 months to the attack of *Lentinus lepideus*, (*a*) and (*b*) showed good inhibiting action, particularly in the s.w., with (*a*) somewhat superior in the h.w. The best effect was obtained in the sections below the rails, as intended. PCP was again a failure. Results generally were inferior to pressure treatment before use. Changes in electrical conductivity through (*a*) did not constitute a risk unless all sleepers of a section were treated at once. The practical work, including the testing of sleepers to eliminate those unsuitable e.g. through rot round the nail, or splits, and the tools employed are described and illustrated. At present costs the treatment will be profitable if it prolongs the life of the sleeper by 3 years. Indications so far are that leaching is negligible.

2212. HOLLINGSWORTH, B. C. **Mining timber and its preservation [with discussion].** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (64–84). 2 refs.

Describes the use of timber in coal-mining operations, in roadways and at the face, and discusses the advisability of preservation in the mines. Preservatives, methods of treatment, and the economy gained by preserving mining timber are dealt with.

2213. HOF, T. Buitenproeven med geconserveerde palen. [**Field tests of posts treated with preservatives.**] *Ned. Boschb.-Tijdschr.* 28 (9), 1956 (207–15). [Du.e.]

A progress report after 8 years. Creosote and PCP applied under pressure have given the greatest, and carbolineum applied by brush the least, protection. Results with water-soluble preservatives have varied with their composition, concentration, and method of application.

2214. ELLWOOD, E. L. **Preservative treatment for Australian rail sleepers.** *Repr.* from *Commonwealth Engineer, Melbourne* 44 (1), 1956 (6–10).

Discusses causes of failure as shown by surveys in Victoria and Tasmania, early and recent service tests of treated sleepers, and costs and savings in relation to the future of sleeper preservation.

2215. SINGLETON, W. A. **The architect and timber preservation—the problem of historic buildings.** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (137–45).

2216. VERRALL, A. F. **Non-pressure preservative treatments for exterior woodwork of buildings.** *For. Prod. J.* 6 (11), 1956 (17*A*–18*A*). 4 refs.

A short account of brush, dip, and short soak treatments with a variety of preservatives, which proved successful in protecting exterior woodwork not in contact with the soil. The importance of water repellents is stressed.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

See No. 2187.

843. Fireproofing and Fire Resistance

See also No. 2187.

2217. **List of publications on fire protection.** *Rep. U.S. For. Prod. Lab., Madison* No. 2065, 1956. pp. 2. P.R.

Includes publications from 1931, giving general information and results of research by Madison on fire-test methods, fire-retarding chemicals and treatments, and fire behaviour of treated and untreated wood, wood products and wooden structures.

844. Attack by Plant Organisms

See also Nos. 1714, 1727.

844.1. Sap-staining and Mould Fungi

See also No. 2257.

2218. BURRA, J. A. N. [**Prevention of staining in box shooks.**] *Rep. For. Dep. Cyprus 1955*, 1956 (70).

Control of staining has been obtained on a pilot scale by setting the shooks [no species mentioned] in wire racks under a roof in the open for 72–96 hours before bundling. No sapstain has developed in bundles after 3 weeks' storage, except in the controls bundled straight off the saw, and indications are that by drying in racks, bluestain can be eliminated.

844.2. Wood-destroying Fungi

See also Nos. 1521, 1792 *et seq.*, 2081, 2257.

2219. SAVORY, J. G. **The role of microfungi in the decomposition of wood [with discussion].** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (3–35 + 4 photos). 11 refs.

The results of various observations and tests by different workers and by the author are summarized as follows: (1) The importance of decay due to soft rot is usually overlooked, since in natural conditions it is a very slow form of decay; (2) the microfungi are more resistant to a wide range of conditions than the Basidiomycetes, hence soft rot may become important in some extreme conditions; (3) soft rot is particularly important on timbers with a large surface/volume ratio; (4) some of the final decay in durable hardwoods is soft rot, and much of the final decay of impregnated timber is also due to microfungi.

2220. LIESE, W. K. F. **On the decomposition of the cell wall by micro-organisms.** *Rec. Conv. Brit. Wood Pres. Ass. 1955*, 1955 (159–60 + 5 photos). 6 refs.

Presents 3 photo-micrographs and 2 electron micrographs showing the details of decomposition in different timbers, apparently by both micro-fungi and bacteria.

2221. MEIER, H. Über den Zellwandabbau durch Holzvermorschungspilze und die submikroskopische Struktur von Fichtentracheiden und Birkenholzfasern. **[Cell-wall decomposition caused by wood-decaying fungi, and the submicroscopic structure of Spruce tracheids and Birch wood-fibres.]** *Holz Roh- u. Werkstoff* 13 (9), 1955 (323–38). 63 refs. [G.g.] P.R.

The author proposes the following classification of wood-decaying fungi: brown rot, white rot, simultaneous rot, and soft rot, the simultaneous rot (e.g. *Polystictus versicolor*) being defined as an agent causing an almost simultaneous decomposition of all wood constituents. He also recognizes the following structural elements in the cell wall: middle lamella, primary wall, transition lamella, secondary wall, and tertiary wall. All the fungi used in his tests (*Merulius lacrymans*, *Polyporus betulinus*, *Fomes pini*, *F. annosus*, *Polystictus versicolor*, and *Chaetomium globosum*) destroyed the secondary wall much more easily than other cell-wall components. Results appeared to show that the fibril material of a lignified cell wall is not uniform; the microfibrils of the primary and tertiary wall and of the transition lamella (outer layer of the secondary wall) seem to consist of hemicelluloses, glucan-xylan (or mannan) compounds or of a special cellulose particularly resistant to fungal decay. In Birch fibres, the transition lamellae showed a pattern of two crossing fibril directions; in Spruce tracheids, most fibrils of the transition lamella are roughly transverse to the fibre axis. In the tertiary wall of both species, the microfibrils are nearly parallel to the cell axis and are embedded in encrusting substances; the tertiary wall of Birch contains no lignin and no proteins, but some pectins. The development of the tertiary wall is discussed.

2222. SAVARD, J., and ANDRÉ, A. M. Étude chimique de l'attaque d'un *Triplochiton scleroxylon* par *Poria* sp. et par *Lentinus nigripes*. **[A chemical study of decay in *T. scleroxylon* caused by *Poria* sp. and *L. nigripes*.]** *Publ. Centre tech. for. trop.* No. 10, 1956. pp. 48. 22 refs. [F.]

A study was made, on test-pieces from a single log of *T. scleroxylon*, of (*a*) brown rot caused by *Poria* sp., and (*b*) white rot caused by *Lentinus nigripes*. The test data are given in graphs and tables and discussed in detail. The following conclusions are reached: (1) Pentosans, cellulose, and lignin are destroyed at different rates in (*a*) but at almost the same rate in (*b*). Lignin disappears the most slowly in (*a*) and its proportion in affected wood increases rapidly. In (*b*) the classic analytical methods reveal the presence of attack only by an increase of solubility in NaOH, and this is significant only after a 25% loss of weight. (2) The solubility of the residual constituents often increases considerably with (*a*), and their determination by classic analysis should be supplemented by a study of this solubility. With (*b*), ordinary analytic data retain most of their significance. (3) This 'pre-solubilization' of the cellulose by (*a*) is a serious defect from the point of view of paper-making.

2223. LOHWAG, K. Zur Abbauintensität holzzerstörender Pilze. **[Rate of decay by wood-destroying fungi.]** *Sydowia, Annales Mycologici Ser. II, Horn* 9 (1/6), 1955 (350–6). 6 refs. [G.e.] L.S.

Describes the methods used in the author's laboratory and presents a list, based partly on data from the literature, showing % values for loss of weight caused by 30 species of fungus, indicating in each case the wood species (sap- or heartwood) tested, the duration of the tests, the author, and in some cases the method used.

2224. ELLERTSEN, B. W., and BAXTER, D. V. **The early effects of wood-destroying fungi on certain strength properties of Lake States timbers. I. Basswood.** *Mich. Wood Technol.* No. 11, 1956. pp. 2. 1 ref. P.R.

Tabulates the results of a study on the initial effects of *Pholiota squarrosa-adiposa* on the density of *Tilia americana* wood.

2225. LYR, H. Zur Frage der Widerstandsfähigkeit des Kernholzes erkrankter und gesunder Douglasien gegenüber holzzerstörenden Pilzen. **[Resistance of the heartwood of diseased and sound Douglas Fir to wood-destroying fungi.]** *Arch. Forstw.* 5 (1/2), 1956 (96–103). 9 refs. [G.g.]

Using (*a*) Scots Pine and (*b*) Spruce as controls, heartwood samples of Douglas Fir of (*c*) the sound green (*viridis*) form, (*d*) the *Rhabdocline*-attacked

grey (*caesia*) and (*e–f*) two similarly attacked provenances of the blue (*glauca*) form, were exposed for 3 months to 9 rots separately. The % loss in weight for each is tabulated. The greatest loss was in (*b*); in all cases (*c*) was more resistant than (*a*) but significantly so only against 5 of the rots. Samples of (*d*) (*e*) and (*f*) behaved similarly, with distinctly less resistance than (*c*) though this inferiority was statistically significant only for 4 of the rots. The diseased (*d*), (*e*) and (*f*) proved significantly more resistant than (*a*) only against 2 rots. Sound material of these forms was not available.

2226. BANERJEE, S., and SINHAR, A. K. **Studies in decays of felled timber. I. A rot of Sal (*Shorea robusta*) caused by *Polystictus sanguineus* (L.) Mey.** *Bulletin of the Botanical Society of Bengal, Calcutta* 8 (1/2), 1954 (107–17 + 2 plates). 23 refs. C.G.B.

Sections of logs from timberyards, abundantly infected with the fungus, were examined, and the macro- and microscopic changes occurring in the sapwood are described. Results of staining tests for cellulose and lignin in the various elements of sound and partially decayed sapwood are tabulated, showing the destruction of lignin to be more rapid than that of cellulose. Decay-resistance tests showed that sapwood had low, and heartwood very high resistance, and that polysporous mycelia showed greater decaying capacity than monosporous.

2227. GARLICK, G. G. **Report regarding Building Research Advisory Board Committee on Protection against Decay and Termites in Residential Construction.** *For. Prod. J.* 6 (11), 1956 (485–8).

A summary of the Committee's recommendations to the Federal Housing Administration for 3 regions and 3 types of construction: slab-on-ground, crawl-space, and basement, dealing with construction and treatment of the wood.

845. Attack by Animals

See also No. 1727.

845.1. Marine Borers

2228. Vergelijkend onderzoek naar de duurzaamheid tegen paalworm van tropisch hout in Nederland en elders in Europa, zestiende verslag. **[Comparative study on the resistance to marine borers of tropical timbers in the Netherlands and elsewhere in Europe. Sixteenth report.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (58–62, 81–2). 2 refs. [Du.e.]

[Cf. *F.A.* 16 No. 3534.] A progress report including preliminary data from blocks exposed in a Venetian lagoon; these differ for some species (e.g. *Eusideroxylon zwageri, Shorea laevifolia* and *Lophira procera*) from those for blocks exposed off Zeeland.

2229. WANGAARD, F. F. **The natural marine borer resistance of tropical American woods.** *Trop. Woods* No. 105, 1956 (38–43). 9 refs.

At Harbour Island, N.C., hardwood sticks (2 × 3 × 18 in.) were used to test the relative resistance of 40 species to *Bankia, Limnoria, Martesia,* and *Teredo.* A table is given of the 19 species so far found most resistant, with their SiO_2 content and degree of attack (none, light, moderate etc.) after 16–18, 24 and 36 months. Of the 10 lightly attacked at 24 months, 7 had > 0·43% SiO_2, and of those retaining this rating at 36 months 4 out of 5 had 0·688–1·52%. Of the less resistant, only one was recorded as having an appreciable SiO_2 content. The exceptions are discussed and it is claimed that high SiO_2 content is paralleled by high resistance to all these borers and not only to some, as hitherto supposed.

2230. BECKER, G. Über die Giftwirkung von anorganischen Salzen, α-Chlornaphthalin und Kontaktinsektiziden auf die Holzbohrassel *Limnoria.* **[Toxic effect of inorganic salts, α-chloronaphthalene and contact insecticides on *Limnoria*.]** *Holz Roh- u. Werkstoff* 13 (12), 1955 (457–61). 28 refs. [G.g.] P.R.

Results of tests of preservatives on a *Limnoria* culture showed that the sparingly leachable salt mixtures (chromate/arsenate with or without fluoride, chromate/ZnF_2) gave poor results in aquarium tests, whereas a copper/chromium salt mixture proved quite promising. Commercial α-chloronaphthalene was a poorer preservative than creosote and seems unsatisfactory (when used alone) in marine constructions. Synthetic insecticides (γ-BHC, δ-BHC, chlordane, aldrin, dieldrin, toxaphene), in particular γ-BHC, are toxic to *Limnoria.*

845.2. Terrestrial Borers

See also Nos. 1262, 1892.

2231. NUORTEVA, P., and NUORTEVA, S. L. Das Auftreten holzzerstörender Insekten in einigen Schärenkirchspielen Südwestfinnlands. **[The occurrence of wood-destroying insects in some island parishes of S.W. Finland.]** *Annales Entomologici Fennici, Helsinki* 20 (4), 1954 (1955), (164–71). 14 refs. [G.e.] I.I.E.

Anobium spp. occurred in 56% of the houses and caused most damage; *Camponotus herculeanus* also did severe damage, particularly to bath houses; other insects found were *Buprestis* spp., *Callidium violaceum, Ernobius mollis, Dermestes lardarius* and *Sirex* spp. *From authors' summary.*

2232. RASMUSSEN, S. **Nutritional preference experiments with larvae of house longhorn beetle, *Hylotrupes bajulus*.** *Oikos* 7 (1), 1956 (82–97). 4 refs.

Thin slices of Pine sapwood and filter paper were used, impregnated with peptone in concentrations of 0·1, 2, 4 or 8%. In all cases the growth rate (as shown by the weight of the larvae) increased with peptone concentration; the increase was still higher in wood with yeast extract, but in paper that had no vitamins the yeast extract had little effect. The experiment shows that larvae of *H. bajulus* prefer high concentrations of peptone, the exception being in wood without yeast where the larvae were small enough to live in one piece of veneer without reaching the surface. Results indicate that the

reaction of the larvae is due to the nutritional value of the food rather than to peptone concentration.

2233. KINGHORN, J. M. **Sapwood moisture in relation to *Trypodendron* attacks.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (5), 1956 (3–4).

Blocks of sapwood were taken from freshly cut logs and their m.c. measured, and similar blocks cut and weighed after borer attack had developed. There was no indication that m.c. of sapwood influenced choice of logs for attack though, after the beetles have entered the wood, lack of moisture necessary for the development of ambrosia fungus doubtless influences abandonment by adults and survival of broods.

2234. BECKER, W. B., ABBOTT, H. G., and RICH, J. H. **Effect of lindane emulsion sprays on the insect-invasion of White Pine sawlogs and the grade yield of the resulting lumber.** *J. econ. Ent.* 49 (5), 1956 (664–6). 2 refs.

Pinus strobus logs were felled in spring, sprayed with lindane at different concentrations, stored out-of-doors, and in October barked for a tally of galleries of Cerambycidae, Buprestidae, Scolytidae (bark and ambrosia beetles) and Curculionidae. The species are listed. The logs were then sawn and the recovery under various concentrations tabulated by grades. Concentrations in water of 0·1, 0·2 and 0·4% by volume of the γ isomer applied at ca. 4½ fluid oz./sq. ft. gave 87·2–100% protection on gallery tally. The 0·1% concentration was too weak for ambrosia beetles. Down-grading of the lumber (mainly due to cerambycids with some buprestids) by one or more grades to No. 5 Common was 6–9% in the sprayed against 87% for the control. BHC of equivalent isomer content should be as effective as, and much less expensive than, this refined form.

2235. ROONWAL, M. L., CHATTERJEE, P. N., and THAPA, R. S. **Experiments in the effect of kiln-seasoning of planks from three species of timber (*Terminalia belerica*, *Terminalia tomentosa* and *Eugenia jambolana*) as a protection against insect borers.** *Indian For.* 82 (9), 1956 (455–68).

Kiln-seasoning was found to have no effect in increasing the resistance of these timbers to attack by 7 species of powder-post beetle. *E. jambolana* is naturally highly resistant, the other two highly susceptible.

845.3. Termites

See also No. 2227.

2236. HUGHES, J. F. **Drywood termites.** Government Printer, Dar es Salaam. 1954. pp. 6. P.R.

Describes *Cryptotermes* species, their habits, development of an infestation, and remedial and preventive measures.

2237. PENCE, R. J. **The tolerance of the drywood termite *Kalotermes minor* Hagen to desiccation.** *J. econ. Ent.* 49 (4), 1956 (553–4). 5 refs.

Tabulates data on duration of survival (7–9 months) and loss in weight of *Kalotermes* sealed in cells of kiln-dried Pine wood. These insects may be fatally affected by sudden changes in moisture or heat (e.g. infra-red heat at 130° F.) where they have insufficient opportunity for refuge in their sealed-off areas. [Cf. *F.A.* 12 No. 579.]

2238. MORRIS, R. C. **Preliminary studies on drywood termites and their control in the Southern United States and Panama Canal Zone.** *Abstr.* in *Proceedings 51st Annual Convention, Association of Southern Agricultural Workers, Dallas 1954*, 1954. (100–1). C.G.B.

Trichlorobenzene or ethylene dibromide sprayed or painted on surfaces was shown to penetrate infested woods and kill the termites in them. Injection treatment gave excellent control. By adding a poison such as chlordane, γBHC or DDT to trichlorobenzene (the U.S. Army and Navy use a 2% solution of chlordane), attack and reinfestation appear to be preventable. By using a 30-c.c. syringe and needle, valuable furniture could be saved without injuring the surface. Fumigation of sealed buildings in the Canal Zone with MeBr gave good results. Mineral spirits, kerosene or fuel oil used as solvents in surface treatments, did not penetrate sufficiently. Pressure injection of poison dusts killed only the termites in galleries reached by the dust.

846. Steaming

2239. KOLLMANN, F., and HAUSMANN, B. Vergleichende Untersuchungen beim indirekten und direkten Dämpfen von Rundholz. **[Comparative investigations on indirect and direct steaming of logs.]** *Holz Roh- u. Werkstoff* 13 (10), 1955 (365–71). 21 refs. [G.g.] P.R.

Although steaming pits with indirect heating involve a larger outlay, their steam consumption is less than that in pits with direct heating (131–142 against 188–222 kg./cu.m. of Beech wood), and the water of condensation can also be utilized. No differences could be found between the two steaming methods as regards variations in moisture content, but indirect heating allows a slower and more uniform temperature rise, thus preventing checks in refractory woods.

847. Drying (Seasoning)

See also Nos. 1711–3, 2092, 2098, 2170, 2235.

2240. FOUNTAIN, W. C. **Sticker losses.** *B.C. Lumberm.* 40 (9), 1956 (58, 60).

A survey of 21 mills in British Columbia suggests that the money loss in rejected stickers averages 30 cents/1000 bd. ft. dried. Causes of rejection are listed and the types of damage incurred during stacking, transfer, kilning and unstacking are detailed. The life of stickers might be doubled by more careful handling and by modifications to stacking and unstacking machines.

2241. PRATT, W. E. **Estimating the moisture content of lumber during the drying process.** *For. Prod. J.* 6 (9), 1956 (333–7).

Estimates based on the weight of stacked unit loads of California Redwood timbers, measured by pressure-gauge weighing devices on fork-lifts during various stages of the process, are considered equal

to or better than m.c. determinations by conventional methods, e.g. sample boards or electrical moisture meters. Degree of reliability can be predicted with fair accuracy. The formulae used are discussed.

2242. KAUMAN, W. G. **Equilibrium moisture content relations and drying control in superheated steam drying.** *For. Prod. J.* 6 (9), 1956 (328–32). 21 refs.

A review of the literature and a discussion of the psychrometric variables involved in drying with superheated steam and steam/air mixtures, with charts relating relative humidities, equilibrium moisture content of wood, dry- and wet-bulb temperatures and steam content of the drying atmosphere, and making recommendations for the application of the process.

2243. LADELL, J. L. **High temperature drying of Yellow Birch.** *For. Prod. J.* 6 (11), 1956 (469–75). 13 refs.

A report on 4 experimental runs with high-grade Yellow Birch boards (1 in. × 8 in. × 8 ft.) at 215° or 220° F. and drying times of 43–50 hours. Initial and periodic steaming to prevent pre-drying and reduce stresses and moisture gradients were applied. In general, degrade was little, if at all, greater than with conventionally dried timber, collapse of heartwood boards being the most prevalent defect. Discoloration was moderate. Compared with conventionally dried controls, shrinkage was 1½ to 2% greater, uniformity of m.c. about equal for similar air-flow conditions, static bending strength somewhat greater, toughness equal, and power consumption per lb. water evaporated less. Conditioning resulted in an unexpectedly low equilibrium m.c.

2244. VILLIÈRE, A. **Seasoning of lumber by high-frequency currents.** *Transl. For. Prod. Lab. Can.* No. 103, 1956. pp. 12. 1 ref. Transl. from *Rev. Bois. Appl.* 11 (1), 1956 (26–31). Limited distribution.

Describes methods and apparatus and results from an industrial plant in Switzerland, and estimates costs.

2245. COLGROVE, W. H. **Chemical seasoning of lumber.** *For. Prod. J.* 6 (10), 1956 (417–9). 7 refs.

Briefly reviews the history of the process, and discusses the chemicals used, modes of application, effectiveness, influence on drying schedules and effect on wood properties.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 1653-4, 2161.

2246. CHESLEY, K. G., HAIR, J. C., and SWARTZ, J. N. **Underwater storage of Southern Pine pulpwood.** *Tappi* 39 (9), 1956 (609–14). 7 refs. P.R.

Pulping tests on wood stored up to 7 months in the yard, or up to 12½ months under water, showed that both yield and quality of kraft pulp were significantly reduced by yard storage, but neither was affected by underwater storage.

2247. **Saw mill and engineering. New Swedish timber loader. Versatile hydraulically operated unit for forest and saw mill work.** *Timb. Tr. J.* 219 (4179), 1956 (90).

Developed by K/B Kewaco of Luleå, Sweden, for use with their KBK loading machine (which has an alternative bucket attachment for earth etc.), it provides a substitute for conveyor systems. It can be used also with Volvo and Bolinder-Thinktell tractors. The fork can lift logs off the ground, models varying in lifting capacity from 1200 to 2300 kg.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See also No. 1606.

2248. **Log defect study.** *Rep. Tenn. Vall. Auth. 1955/56*, 1956 (36).

Examination of 5095 hardwood logs (65% Oaks) showed that % volume deductions for rot, split, and shake all increased with log diameter. In Oaks, position of logs in the tree affects % volume loss through rot, which was 3 times as great in butt logs as in upper ones.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 1663, 1714, 1735, 2075, 2268.

2249. SCHULZ, H. Untersuchungen über die Bewertung von Eichenstammholz. **[Evaluation studies of Oak stemwood.]** *Forstarchiv* 26 (8), 1955 (182–4). 1 ref. [G.]

Oak stems were examined on a site producing veneer logs in the Freienwald forest. Some data are given on the width of annual rings and bark thickness. The size of knots and the extent of spiral grain (if present) can be estimated from the appearance of the bark.

2250. SCHMIED, H. Harznutzung und Harzaderngrösse bei der Lärche. **[Resin-tapping—its effect on the size of resin streaks in Larch.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 52, 1956 (44–73). [G.g.]

Investigations on stumps and on boards cut from Larch in E. Carinthia showed that the number of stumps free from streaks was 10%, and that of stems free from the defect 20%, greater in tapped than in untapped trees, and that mean length of streaks and height up the stem were considerably greater in untapped trees. Except where all streaks were tangential, the effect of tapping in reducing streak frequency was greater in the stem than in the stump.

2251. NEČESANÝ, V. Třídění bukových jader. **[Classification of Beech hearts.]** *Dřevo* 11 (4), 1956 (93–8). 37 refs. [Cz.g.] P.R.

The author first reviews previous work, particularly that done by Pejoski [see *F.A.* 14 No. 2849], Paclt [see *F.A.* 14 No. 3699; 16 No. 879] and Vakin, *et al.* [see *F.A.* 14 No. 2617]. As long ago as 1937, Haus [*Prace Ministerstwa Leśnictwa Instytut badawczy Leśnictwa Warszawa* 28 (1–41)] found that the boundaries of circular Beech heartwood coincided

with growth rings formed in years of severe frosts; he distinguished 'new frost heart', 'frost heart' (formed in 1929), and 'false heart' (formed before 1929). In Macedonia, Pejoski found no frost heart. He believed the first stage of heartwood formation to be due to the penetration of saprophytic fungi into the stem. Paclt distinguishes 4 stages of heartwood: (1) very wet heart with dispersed cell substances and without tyloses (identical with the initial stage of frost heart); (2) red (-brown) heart, egg-shaped or star-shaped, with many tyloses but without hyphae; (3) heartwood with traces of fungal infection (the 'mosaic' or 'flame' heart); and (4) the final stage when rot sets in. Paclt affirms that Beech with (1) or (2) is sound from the technical viewpoint, while (4) is unsound, and (3) is unsafe because it might develop into (4). Vakin *et al.* distinguish, on the basis of macroscopic appearance, (*a*) simple round heart; (*b*) mosaic-like multiple heart; (*c*) two-layer round heart and (*d*) star-shaped heart. In (*c*) the inner part is the false heart, the outer the frost heart; (*a*) is believed to be identical with false red heart. The author's own investigations demonstrate that the differences in moisture content and mean frequency of tyloses between the inner and outer layers of (*c*) remain significant a long time after the formation of frost heart, and diminish only very slowly. He believes that tyloses can be formed only under the following conditions: (1) presence of living parenchyma cells, particularly those of the rays, (2) presence of oxygen, and (3) presence of senescent and dead cells. The formation of tyloses is very rapidly followed by that of heartwood extractives in the same cell. Tyloses are least frequent in frost heart. Nečesaný concludes from work done by other authors on *Fagus sylvatica*, *Acer saccharum* and *Nothofagus cunninghamii* that the star-shaped and flame hearts in Beech are due entirely to fungal infection. Other of his experiments showed that the liquid expressed from the heartwood of a freshly felled Beech tree, filtered through a bacteriological filter and mixed with sterilized malt, was a much less favourable medium for the growth of *Schizophyllum commune* than an identically processed liquid from the sapwood which, in turn, was less favourable than the liquid from heartwood after sterilizing in an autoclave. He finally proposes the following classification of Beech heartwood from the standpoint of utilization: *A*—simple red, *B*—frost, *AB*—double, *C*—mosaic (*Ca*—mosaic red-brown, *Cb*—yellow-brown), *D*—flame, and *E*—rotten. The following table of utilization is suggested (I means utilization with slight limitations; II, with medium limitations; III, with severe limitations, and IV, no utilization at all): for sleepers, I—*A, B, AB*; II—*C*; III—*A*–C,* D*; IV—*E*; for bent furniture I—*B, AB, C*; II—*A*, IV—*D, E*; for veneer I—*A, B, AB, C*; III—*A*–C*, D*; IV—(*D*), *E*. (*A*–C** are heart types with incipient rot, i.e. light efflorescence, grey-brown lines or zones.)

2252. RAUNECKER, H. Der Buchenrotkern nur eine Alterserscheinung? **[Is red heart of Beech merely a result of ageing?]** *Allg. Forst- u. Jagdztg.* 127 (1), 1956 (16–31). 44 refs. [G.g.e.]

In discussing various suggested explanations of red-heart and frost-heart formation, the author inclines to Gäumann's theory [see *F.A.* 16 No. 1886] and considers it a reaction to untraceable toxins emanating from microorganisms, e.g. mycorrhizae, under certain conditions, such as osmotic disturbances resulting from temporary reductions in moisture content. Data on vertical and horizontal variations in m.c. and density for stems with white and red heart, and in relation to chemical analyses of woods, soil analyses of poor and good sites (pH values, water and air capacities), and stem forms, are presented. Stems with red heart showed greater differences in m.c. between periphery and centre, with heartwood values $< 60\%$. In high-forest trees, m.c.s were higher at the crown than at the butt. Sp. gr. tended to be lower on the poor sites where red heart was prevalent, and to fluctuate more in diseased trees. Discolored areas and areas of low sp. gr. tended to occur at the same levels in a stem. No connexion was found between Fe and Ca content and red heart. No glucose was found in stems from good sites, but varying amounts, associated with tendency to red heart, in stems on poor sites. Conservation of mild humus by using species mixtures on the less suitable sites, regeneration in groups, and a thinning system promoting cylindrical stem form are advocated as preventive measures.

2253. OHSAWA, M., and NOGAMI, K. **[Being-state [Condition] of tyloses in vessels of false heartwood of Beech.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (893–915 + 4 photos). 6 refs. [Jap.jap. e.]

In the hope of devising a practical mechanical or chemical method of destroying the tyloses which impede the entry of preservative, a detailed study of the distribution of tyloses in the heartwood (rarely in the sapwood) of Beech [*Fagus crenata*?] is presented in 19 tables. The [vertical?] interval of their occurrence is 150–250μ.

2254. FLEISCHER, H. O. **The longitudinal shrinkage of Cativo [*Prioria copaifera*].** *Trop. Woods* No. 105, 1956 (1–5). 5 refs.

Complaints of the instability of this veneer wood, reputed to be dimensionally extremely stable, are shown by laboratory investigation to be due to tension wood, recognizable by its fuzzy, fibrous appearance on a cross-cut surface. For high stability in veneer and plies it is necessary to exclude obvious tension wood.

854. Grading of Converted Timber

2255. KAUMAN, W. G., GOTTSTEIN, J. W., and LANTICAN, D. **Quality evaluation by numerical and subjective methods with application to dried veneer.** *Repr.* from *Biometrics, Washington* 12 (2), 1956 (127–53). 14 refs.

The subject of study was seasoning degrade in Ash-type Eucalypt veneer, using two types of evaluation: (1) 'subjective', in which the amount of degrade is classified by visual inspection into 6 severity classes (none, very slight, slight, moderate, severe, very severe), and (2) 'numerical', in which it is classified into 6 severity classes based on total

combined length of all checks or splits in the sample. The experiment showed that (1) can yield results of an accuracy very little inferior to that of (2), but that two observers would have to take 4 readings, and 3 observers 2 readings, each, to obtain the desired accuracy. In general (1) requires 40% more readings than (2) to give similar accuracy, but (2) occupies considerable more time than (1).

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 1600, 1649, 2022, 2036–8, 2087–8, 2106 *et seq.*, 2203, 2222, 2246.

2256. SCHATZL, H. Dünnholz- und Birkenverarbeitung in der steirischen Papierindustrie. **[Utilization of small wood and of Birch wood in the paper mills of Styria.]** *Allg. Forstztg.* 66 (1/2), 1955 (5–7). [G.]

Describes improvements in machine barking that make it possible to use straight round Fir and Pine wood down to diameters of 3–4 cm., and Birch down to 8 cm., not only when green, but after the bark has dried in storage.

2257. BEATH, L. R. **The use of stained and rotten wood in the manufacture of newsprint.** *For. Chron.* 32 (3), 1956 (341–5).

A general discussion without any research results. The author concludes that rotten wood could make up $\geq$ 5% and stained (red-heart) wood $\geq$ 20% of wood used at any one time. The importance of careful blending of sound and rotten or stained logs is stressed.

2258. KOEPPEN, A. VON, and SITZMAN, L. **A laboratory investigation of the pulping properties of two *Araucaria* species from New Guinea.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 8, 1954 (264–89). 23 refs.

Tests of physical, chemical and pulping properties of *Araucaria klinkii* and *A. cunninghamii* gave encouraging results. [Cf. *F.A.* 16 No. 2429.]

2259. ISTAS, J. R., HEREMANS, R., and RAEKELBOOM, E. L. Recherche sur la qualité papetière de quelques bambous récoltés au Congo belge. **[The paper-making qualities of some Bamboos grown in the Belgian Congo.]** *Bull. agric. Congo belge* 47 (5), 1956 (1299–1325). 16 refs. [F.flem.]

Tabulates the mineral, cellulose and lignin composition and the fibre dimensions of 10 exotic Bamboos, from culm samples of different age and, in one species, from 3 different soils. Also tabulated are the properties of the pulps and papers prepared from some of them, using 3 methods of cooking. Good sulphate pulps are obtainable but, except in tearing strength, the resulting papers are inferior to those of a medium-quality kraft. It is possible that pressure-impregnation cooking would improve quality. *Bambusa vulgaris* and its var. *striata* gave the best pulps. *Sasa kurilensis* and *S. japonica* do not appear suitable for unbleached pulp. Three months of water storage did not reduce *Dinoderus* attack. Though one-year culms are usable, it is better to use older ones. Soil affects paper quality and more investigations of the effect of site are required. In addition to those mentioned, the samples included *Dendrocalamus strictus*, *Gigantochloa ater*, *Ochlandra travancorica* (for all of which pulp and paper data are presented), *Dendrocalamus longispathus*, *Gigantochloa apus* and *G. verticillata*.

2260. Papier uit gemengd Surinaams loofhout. **[Paper from mixed Surinam hardwoods.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (54–5, 80–1). [Du.e.]

Some data additional to a previous report. [See *F.A.* 16 Nos. 3562–3.]

2261. RAMOS, M. NOGUEIRA. *Brachystegia* spp. de Moçambique. Aspectos de anatomia, constituição química e valor papeleiro. **[*Brachystegia* spp. of Mozambique. Anatomy, chemical constituents and suitability for papermaking.]** *Estud. Ensaios e Docum. Junta Invest. Ultramar, Lisboa* No. 20, 1956. pp. 104 + 21 plates. 56 refs. [Port. port.f.e.]

Presents information on the taxonomy, range, nomenclature, anatomy, and physical and chemical properties of *Brachystegia spiciformis*, *B. bussei* and *B. woodiana*. In cellulose extraction trials, *B. woodiana* gave better results than *B. spiciformis* and *B. bussei*, though *B. spiciformis* compared well with species currently used in industry. Trials with various commercial processes were made with *B. spiciformis*, the most abundant of the 3 species in Mozambique. The alkaline processes, and particularly the sulphate, proved the most suitable. Kraft pulps of *B. spiciformis*, although inferior in chemical properties, have mechanical and physical properties very similar to other industrial pulps. Strength of the pulp was considerably affected by bleaching. 'Successive' bleaching, using 13% of available Cl proved to be the only satisfactory method.

2262. YONEZAWA, Y., *et al.* **[Experiments on pulp woods.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 82, 1955 (29–44). 3 refs. [Jap.e.e.]

Presents in various detail, in 15 tables, the cooking conditions and the yield and properties of pulps prepared by the sulphate, sulphate semichemical, and neutral sulphite semichemical methods from (*a*) *Shiia sieboldii*, (*b*) 'Red Lauan' [*Shorea* spp.], (*c*) 'White Lauan' [*Parashorea*, *Shorea* and *Pentacme* spp., especially the last], (*d*) *Fagus crenata*, (*e*) *Pinus densiflora*, and (*f*) mixtures of the last 2 in various proportions.

2263. GIERTZ, H. W. Träkemiska aspekter på halvkemisk massa. **[Aspects of wood chemistry in semichemical pulping.]** *Norsk Skogind.* 10 (11), 1956 (389–94). 5 refs. [Nor.e.] P.R.

Discusses the chemical action of different semichemical pulping methods, yield in relation to lignin amounts in the middle lamella and fibre wall in hardwoods and softwoods, and properties of paper from semichemical pulp.

2264. STONE, J. E., and FÖRDERREUTHER, C. **Studies of penetration and diffusion into wood.** *Tappi* 39 (10), 1956 (679–83). 2 refs. P.R.

The rates at which Na_2SO_3 and $(NH_4)_2SO_3$ move into Aspen sapwood have been compared under near-industrial conditions. Little, if any, difference was found between the effect of the two chemicals, regardless of chip length, moisture content (m.c.) or time and temperature factors. With a given salt and varying m.c., the 'burning' (turning brown when heated without cooking liquor) increased in the order: water-saturated, oven-dry, intermediate m.c. The amount of 'burning' also increased with a decrease in heat-up time. Wood blocks with their fibres running vertically took up more chemical in a given time when immersed in liquor than did blocks where the fibres lay horizontally. Blocks of several different species, immersed in a salt solution and centrifuged, absorbed much more salt than similar blocks immersed but not centrifuged. *From authors' summary.*

2265. BRIGGS, D. A. E., DEAN, J. D., and SAUL, C. M. **Sulphate pulping of *Eucalyptus gigantea* [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 9, 1955 (49–70). 14 refs.

Presents the results of an investigation on the influence of sulphidity in the 0–35% range on alkali requirement, yield, degree of polymerization and strength of pulps prepared to constant permanganate number.

2266. BHAT, R. V., GUPTA, P. R., and KAPUR, R. L. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part XXVIII. Wrapping papers from Blue Gum (*Eucalyptus globulus* Labill.).** *Indian For.* 82 (10), 1956 (514–21 + sample sheet). 1 ref.

Laboratory experiments on the production of pulps from Blue Gum by the sulphate and soda processes are described. One pilot-plant experiment by the sulphate process yielded 57·9% of well cooked pulp of light brown colour. Wrapping paper made from 100% Blue Gum was characterized by good formation and satisfactory strength properties. Since Blue Gum is short-fibred, its pulp will require mixing with a suitable % of a long-fibred pulp, such as Bamboo, for the manufacture of wrapping papers on commercial paper machines. A sample of the wrapping paper made on the pilot plant is included in this bulletin. *From authors' summary.*

2267. BHAT, R. V., and GUPTA, P. R. **Cold caustic soda pulps and cheap grade writing and printing papers from Blue Gum (*Eucalyptus globulus* Labill.).** *Indian For. Bull.* (*n.s.*) No. 211, 1956. pp. 11 + 2 specimen sheets. 5 refs.

Unbleached pulps in high yields (80–83%) and at low cost can be prepared from *E. globulus* by the cold NaOH process; papers from such pulps are sufficiently strong for cheap uses.

2268. **The pulping of tension wood.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1954/55,* 1955 (92).

Tension wood (*a*) and normal wood (*b*) from one tree of *Eucalyptus goniocalyx* were pulped by the soda process. Although (*a*) was much lower in lignin than (*b*), it required similar pulping conditions to defibre the chips. Pulp yield was much higher—67% for (*a*) against 51% for (*b*). Chips from (*a*) did not swell when cooked. Pulp from (*a*) gave handsheets with much lower strength properties than those from (*b*). Chips from (*a*) could be mechanically defibred to give a reasonable grade of pulp whereas (*b*) under similar conditions was reduced to a coarse powder.

2269. SIMMONDS, F. A., *et al.* **Loblolly Pine high alpha prehydrolysis-sulphate pulps.** *Tappi* 39 (9), 1956 (641–7). 7 refs. P.R.

Gives for a series of unbleached and purified pulps prepared with three durations of prehydrolysis, the % yield of pulp, and the %s of α-cellulose, pentosans and mannans, and data on viscosity.

2270. PEARSON, A. J. **Semibleaching of *Pinus radiata* kraft pulp [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 8, 1954 (27–49). 12 refs.

Presents the results of bleaching tests on kraft pulp from New-Zealand-grown *P. radiata* for processes using $Ca(OCl)_2$ in one or two stages.

2271. JAMES, C. F., and WARDROP, A. B. **A microscopic study of structural changes during the beating of wood fibres [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 9, 1955 (107–26). 12 refs.

Presents the results of electronographic investigation (Al shadow-casting techniques) of the changes during beating in fibres obtained by different methods.

2272. WATSON, A. J., and HODDER, I. G. **Relationship between fibre structure and handsheet properties in *Pinus taeda* [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 8, 1954 (290–310). 6 refs.

Handsheet properties were correlated with basic density, and therefore with the fibre wall thickness which, along with fibre diameter, appeared to be the main fibre properties affecting paper characteristics.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 2035, 2136, 2146.

2273. KLAUDITZ, W. Entwicklung, Stand und holzwirtschaftliche Bedeutung der Holzspanplattenherstellung. **[Development, present status and economic importance of chipboard manufacture.]** *Holz Roh- u. Werkstoff* 13 (11), 1955 (405–21). 67 refs. [G.g.] P.R.

After a detailed survey of the development of the chipboard industry in Germany before 1950–51, the author describes and discusses improvements in manufacture and extensions in use, up to 1955.

2274. KOLLMANN, F. Automatisierung bei der Herstellung von Holzspanplatten. **[Automation in chipboard manufacture.]** *Holz Roh- u. Werkstoff* 13 (11), 1955 (421–33). 5 refs. [G.g.] P.R.

An illustrated account of the increasing role of automation in W. German chipboard plants.

2275. KOLLMANN, F., SCHNÜLLE, F., and SCHULTE, K. Untersuchungen zur Beleimung von Spangemischen. **[Investigations on adding glue to chip mixes.]** *Holz Roh- u. Werkstoff* 13 (11), 1955 (440–9). 20 refs. [G.g.] P.R.

Presents the results of experiments on the relationships between the viscosity and wettability of the binder, its distribution on the surface of the chip, its nature and the proportion used on the one hand, and the quality of the final product, the chipboard, on the other. The relationships were found to be extremely complex, needing further investigations.

2276. KLAUDITZ, W., and STEGMANN, G. Beiträge zur Kenntnis des Ablaufes und der Wirkung thermischer Reaktionen bei der Bildung von Holzwerkstoffen. **[The nature and effect of thermal reactions in the formation of composite wood.]** *Holz Roh- u. Werkstoff* 13 (11), 1955 (434–40). 24 refs. [G.g.]

Presents, in the form of tables, the results of studies on the changes in physical and chemical properties of (*a*) Poplar wood specimens and (*b*) heat-stabilized, binderless, chipboard from Poplar chips 0·2 × 2–3 × 8–10 mm. The temperatures applied were 170–200° C., the pressures for making (*b*) were 60–200 kg./sq. cm. Heating causes loss of weight and reduces tensile stress and the equilibrium moisture content; the hemicelluloses are first affected. The (*b*) material contains as binders the partial decomposition products of the wood. Its strength properties match those of chipboards made with 1·25% synthetic-resin binder (density 1·2 g./c.c.); boards with a greater % of binder, particularly those of lower density, are stronger.

2277. LAMBERTS, K., and PUNGS, L. Über die Anwendung der Hochfrequenzerwärmung in Verbindung mit Kontakterwärmung bei der Herstellung von Holzspanplatten. **[Use of HF heating combined with contact heating in the manufacture of chipboards.]** *Holz Roh- u. Werkstoff* 13 (11), 1955 (450–6). 4 refs. [G.g.] P.R.

The tests deal with (1) the preheating method, in which the chip cake, compressed to twice the final thickness, is preheated outside the press in an HF field, and (2) the combined method in which HF and contact heating act simultaneously during the pressing operation. The rise of temperature and the process of curing were investigated for both methods and compared with pure contact heating, the resultant saving in time being determined. The specific work required for the hardening per unit wood volume is indicated in KWH for method (2). The times required for hardening are given for the initial moisture content (ca. 14%) and a press platen temperature of 140° C. These times can be further reduced both for pure contact heating and for method (2), by reducing the initial m.c. and raising the press temperature. *From authors' summary.*

2278. **Raising hardboard output.** *Timb. Tr. J.* 219 (4187), 1956 (72–4).

Describes the fully automatic plant recently installed at Sunbury-on-Thames by the P.I.M. Board Co. Ltd. for the production of fibre building board from home-grown softwoods.

2279. HARSTAD, F. L. Wallboardindustriens anvendelse og utnyttelse av råstoffet—og forbrukernes kvalitetskrav til trefiberplater. **[Use and treatment of raw material by the wallboard industry, and users' quality requirements for wallboard.]** *Norsk Skogind.* 10 (6), 1956 (204–13). [Nor.e.] P.R.

Discusses, with illustrations, the types of raw material used and the lay-out of a mill making hardboards and insulating boards and using roundwood, small wood or slabs in separate production lines to the chipper. Gives figures for the % of acceptable chips obtained after screening on different mesh screens, and the yields obtained after defibration in laboratory tests. Discusses the difficulties in calculating yields of boards (usually expressed in terms of weight) in relation to consumption of raw material (calculated by volume). Gives diagrams showing % losses for different processing stages from screening to cutting the boards to size, and total yields (80·5 and 65% by weight of raw material for boards from chipped roundwood and unbarked slabs respectively). Briefly discusses mechanical strength and technical requirements of boards.

2280. FARMER, R. H. **The manufacture of hardboard: experimental work on the use of tropical timbers.** *Repr.* from *Proceedings of the Technical Section of the British Paper and Board Makers' Association, Kenley* 37 (1), 1956. pp. 13. P.R.

Describes experiments at Princes Risborough on the production of hardboard from a number of tropical timbers by a semi-chemical process. Hardboards with satisfactory properties have been made in this way on an experimental scale from several dense hardwoods from Malaya and British Guiana.

2281. COWLING, R. L. **Experimental hardboard from Radiata Pine and Eucalypt species [with discussion].** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 9, 1955 (127–50). 30 refs.

Experiments and some processing difficulties with *Pinus radiata* and with the sawmill waste of *Eucalyptus sieberiana* and *E. regnans* are described. The results of tests for strength, resistance to water, and dimensional stability are given, and the improvement effected by higher temperatures of water-cooking and of hot-pressing is noted. Wet-pressed and dry-pressed boards from *E. regnans* sawdust are compared and the latter found to expand more in moist air despite a lower gain in moisture. Boards dry-pressed without pressure relief appear to be stronger than when a 'breathing' cycle is employed. *From author's summary.*

2282. **Wood fiber composition filters deadly gases.** *Veneers & Plyw.* 49 (11), 1955 (37–8). P.R.

A fibreboard developed at Madison filters poisonous war gases and protects against the heat effect of atomic explosions. The filtering effect was attained by adding certain chemicals. Pilot-plant tests show that the boards can be made in any

existing fibreboard plant from wood waste of any species. [Cf. *F.A.* 17 p. 311.]

2283. JOHNSON, J. W. **Dimension changes in hardboard from soaking and high humidity.** *Rep. Ore. For. Prod. Lab.* No. *T*-16, 1956. pp. 11 + 7 gphs., 4 tbls. 5 refs. P.R.

Specimens from 36 types of commercial hardboard were exposed to water soaking for 24 hours and also to a relative humidity (r.h.) of 90% for 8 months. Water absorption, thickness swelling and linear expansion were measured periodically. The boards were grouped into 5 classes, the representative curves for each class being drawn and several tables compiled showing various relationships between moisture content, thickness swelling, linear expansion, board density and time. Straight-line relationships between % of water absorption and thickness swelling were found for most boards in the soak test; all the boards absorbed water at roughly the same rate, provided that rates of absorption were based on % of total water absorbed. Within 10 days after exposure to high r.h. conditions, most of the boards reached roughly the same moisture content; the water absorbed was ca. 85% of that absorbed during 8 months of exposure.

863. Wood Hydrolysis. Saccharification

See No. 2285.

866. Utilization of Wood Extractives

See also Nos. 2027, 2107.

2284. Oost-Afrikaanse cederhout olie. **[Oil from *Juniperus procera* wood.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (10–3, 74). 5 refs. [Du.e.]

Of 2 samples of oil from Kenya, one contained 7%, the other 31% cedrol.

867. Destructive Distillation

2285. WENZL, H. F. J. Holz als Chemie-Rohstoff. **[Wood as chemical raw material.]** *Holzforschung, Berlin* 10 (5), 1956 (129–43). 94 refs. [G.g.e.] P.R.

Discusses the chemistry and chemical processing of wood pyrolysis and alkaline oxidation products and of the intermediate products involved [cf. *F.A.* 16 No. 3581] in relation to the utilization of wood-sugar hydrolysates and to the production of chemically and economically interesting products from these hydrolysates.

2286. LANE, P. H., and SPRENGER, G. E. **Design of an experimental sheet metal charcoal kiln.** *Tech. Note Lake St. For. Exp. Sta.* No. 471, 1956. pp. 2.

Describes a cheap, easily constructed charcoal kiln of 3-cord capacity. Double walls with a space for insulation and sand help to conserve heat and provide an air-seal. Diagrams show the plan and a cross-section of the kiln.

2287. OLSON, A. R. **An Iranian charcoal kiln.** *For. Prod. J.* 6 (9), 1956 (345–8).

Describes and illustrates the construction and operation of a structure, made of timber, stone, and mud, for the carbonization of wood in N. Persia, and the principles on which it operates. These are quite different from any systems described in Western literature.

88. Economy in the Use of Wood. Replacement of Wood by Competitive Materials

See No. 1661.

89. Other ('Minor') Forest Products

892. Vegetable Products

892.1. Grass. Litter. Leaf fodder etc.

See No. 1934.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 1637–40, 1658, 2038, 2112, 2301–2.

2288. GRASSMANN, W., *et al.* Über den Gerbstoff der Fichtenrinde. **[The tanstuff of Spruce bark.]** *Chem. Ber.* 89 (11), 1956 (2523–35). 26 refs. [G.g.] P.R.

A tanstuff constituent has been isolated from the bast of Spruce bark in the form of crystallized glucoside and the corresponding glucone ($C_{18}H_{16}O_5$ and $C_{18}H_{18}O_5$, respectively). The compound is a catechol and contains a double bond.

2289. **[Tannin content of *Brachystegia* and *Pseudoberlinia* barks.]** *Rapp. Inst. nat. Étude agron. Congo belge 1955*, 1956 (450). [F.]

Tannin % in the easily stripped barks, collected in the Katanga sector, was as follows: *B. longifolia*, 7 and 9·4; *B. spiciformis* var. *latifolia*, 5·9; *B. stipulata* var. *velutina*, 8·8; and *P. paniculata*, 8·4–12·8.

2290. HILLIS, W. E. **The production of mangrove extract in the delta region of Papua.** *Emp. For. Rev.* 35 (4), 1956 (420–36). 30 refs.

A general description of the Mangrove forests in the delta of the Kikori and Purari Rivers, with a detailed examination of the barks from *Rhizophora mucronata, R. apiculata, Bruguiera gymnorrhiza* and *B. parviflora.* Bark from the first 3 species yields mangrove tannin extract (cutch), the present and potential uses of which are discussed. Suggestions for utilizing the woody portion of the tree are given. *From author's summary.*

2291. SLUKHAĬ [SLUHAĬ], S. I., and MIKHEEVA [MIHEEVA], I. I. **The influence of some conditions of growth on the content of tannins and dry substances in the leaves of *Rhus cotinus*.** *Dopovidi Akademii Nauk Ukr. R.S.R.* 1955 (551–5). [Ukr.russ.] From *abstr.* in *Chem. Abstr.* 50 (18), 1956 (13178). P.R.

The content of tannins and dry substances varies with the illumination, part of the plant, and time of year, being highest in the upper third of the plant exposed to sunlight in the first half of summer.

2292. ECKBLAD, F.-E. Anatomisk analyse av barkebrødmel av alm og furu. **[Anatomical analysis of bark-bread flour from Wych Elm and Scots Pine.]**

Blyttia, Oslo 13 (1), 1955 (5–9). 2 refs. [Nor.e.] L.S.

Nineteenth-century museum specimens of the flours were examined. Flour from both species consisted of the inner bark, i.e. the secondary phloem, excluding the last year's phloem. In Scots Pine flour, only the inner part of the secondary phloem had been used. [Cf. R. Nordhagen in *F.A.* 17 No. 243.]

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also No. 1273.

2293. RAO, P. R., NAIDU, P. S. B., and PATHAK, T. C. **A note on the preparation of water-soluble copper chlorophyll.** *Indian For.* 82 (10), 1956 (522–3). 9 refs.

2294. PAZOŁA, Z., *et al.* **Optimum parameters for producing vitamin-C concentrates from Pine needles.** *Prace Instytutów i Laboratoriów Badawczych Przemysłu Rolnego i Spożywczego, Poland* 5 (4), 1955 (9–18). [Pol.e.] From *abstr.* in *Chem. Abstr.* 50 (19), 1956 (12403). P.R.

Scots Pine needles are macerated in water at 40–45° C.; the extract is purified with activated C and concentrated. The highest concentration attained was 370 mg./100 g.

2295. BROWN, E. G. **Cinnamon and cassia: sources, production and trade. Part I. Cinnamon.** *Colon. Plant Anim. Prod.* 5 (4), 1955 (1956), (257–80). 36 refs.

2296. HEGARTY, M. P., and LAHEY, F. **The coumarins [of the bark] of *Halfordia scleroxyla* F. Muell.** *Aust. J. Chem.* 9 (1), 1956 (120–31). 22 refs. O.R.S.

2297. HERMAN, J.-P. Étude des propriétés galactogènes et oestrogènes de la sève du parasolier (*Musanga cecropioides* R. Brown). **[The oestrus- and lactation-inducing properties of the sap of *M. cecropioides*.]** *Bull. agric. Congo belge* 47 (5), 1956 (1345–59). [F.flem.]

A series of trials on mature and immature goats, rabbits and rats supports the native belief in the stimulating effects of this sap on the oestrus and lactation.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 1643–5.

2298. BARDYŠEV, I. I., and UHOVA, L. I. Abietinovaja kislota—pervičnaja smoljanaja kislota živicy sosny obyknovennoï (*Pinus sylvestris*). **[Abietic acid—a primary resin acid of the oleoresin of *P. sylvestris*.]** *Dokl. Akad. Nauk SSSR* 109 (1), 1956 (89–90). 7 refs. [Russ.] A.P.B.

Presents experimental evidence to show that this acid is present in the native oleoresin.

2299. MIROV, N. T., and ILOFF, P. M., JR. **Composition of gum turpentines of Pines. XXVIII. A report on *Pinus edulis* from eastern Arizona, *P. tropicalis* from Cuba, and *P. elliottii* var. *densa* from Florida.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 45 (9), 1956 (629–34). 15 refs. O.R.S.

2300. Gommen en harsen. **[Gums and resins.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (42–7, 78–9). 12 refs. [Du.e.]

Gives results of analyses of Tiengie-monie (*Protium* sp.) resin from Surinam, and Elemi (*Canarium mehenbethene*) resin from New Guinea, and of research on water content of frankincense (*Boswellia carteri*) from Massawa.

2301. SPOON, W., and SPRUIT, D. Lawang-olie van Nieuw-Guinea. **[Lawang oil from New Guinea.]** *Ber. trop. Prod. Inst. Trop. Amst.* No. 254, 1956. pp. 9. 9 refs. [Du.e.]

Oil obtained by steam distillation from Lawang (*Cinnamomum* spp.) bark from different parts of New Guinea was of two types: containing (1) 80–100% eugenol (4 samples); (2) varying proportions of eugenol (< 24–50%) and safrol (3 samples). Eugenol content in (1) appeared to be highest in fresh bark, and herbarium material received later showed that the 3 samples in group (2) were all from *C. cutilawan.* Uses of the different types of oil are discussed, and figures for exports from New Guinea are given.

2302. Massooibast-olie en massooiblad-olie van Nieuw-Guinea. **[Massoia leaf and bark oil from New Guinea.]** *Meded. Inst. Trop. Amst.* No. 113 (*Afd. trop. Prod.* No. 43) 1955 (6–10, 73). 5 refs. [Du.e.]

Material, mostly bark but including leaves, twigs, wood and roots, was identified as *Cryptocarya massoia.* The bark contained 1–9% (average 3%) of essential oil; wood and root material smaller quantities of the same oil. Leaves contained 2·5–5% of an essential oil differing considerably from the bark oil. Small twigs contained mainly the leaf oil, and older, larger ones mainly the bark oil. Tables show the composition and amounts of oil from different parts of the tree.

2303. Cacay-zaden uit Colombia. **[Seed of *Caryodendron orinocense* from Colombia.]** *Meded. Inst. Trop. Amst.* No. 116 (*Afd. trop. Prod.* No. 45) 1956 (45–7, 71). 5 refs. [Du.e.]

Oil from the seed was analysed and found to be very similar to that from *Hevea brasiliensis.* The latter deteriorates very rapidly and can only be used for soap-making, purification for technical uses or for cooking being too expensive. The same would probably be true of oil from seed of *C. orinocense.*

2304. GOLOVANOV, N. G., and BROVČINSKIĬ, I. V. Vosk iz hvoi sosny. **[Wax from needles of *Pinus sylvestris*.]** *Priroda, Moskva* 45 (8), 1956 (115). 1 ref. [Russ.] A.P.B.

Needle litter of *P. sylvestris* collected in the Ukraine gave total contents of extractable resins and waxes of 5·8% for acetone and 19·1% for butanol. A pure wax isolated by a process similar to that for extracting montan wax had a fragrant smell which was retained for 6 months and was similar in properties to carnauba and beeswax. The

resinous fraction had the same fragrance. Since resins and waxes are very stable, needle litter contains more of these constituents than needles direct from the tree; the annual needle fall is said to average 6 metric tons/ha. in a mature stand. The top layer of litter (ca. 3 tons/ha.) should yield 200 kg. of pure wax.

2305. STEPHEN, A. M. **The composition of *Hakea acicularis* gum.** *J. chem. Soc.* Nov., 1956 (4487–90). 10 refs. O.R.S.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 1274, 1641–2, 2303.

2306. REITHEL, F. J., and VENKATAMARAN, R. **Lactose in the Sapotaceae [in fruits of *Achras sapota*, *Mimusops roxburghiana* and *Pouteria campechiana*].** *Science* 123 (3207), 1956 (1083–4). 3 refs. O.R.S.

2307. SAVUR, G. R. **Characterisation of Tamarind seed kernel fractions.** *Sci. & Cult.* 21 (12), 1956 (744–6). 12 refs. E.M.B.

Tamarind seed meal is here shown to include three fractions—F1, F2, and F3—with % yields of 2–4, 15–30 and 30–40 respectively. The first is a polyuronide of no interest for jellying or sizing, for which the polysaccharides F2 and F3 are excellent. For these purposes there is no object in separating them. F2 is soluble in water at room temperature but F3 only on boiling for 20 minutes. Tables show yield variations with different conditions of extraction (mesh of kernel flour, dilution, time of extraction and settling). With a mesh of 80, the maximum yield of F2 is got by vigorous stirring for 45–60 mins. For a maximum yield of F2 and F3 using the same meal mesh, dilution with 30 times the weight of water and a settling time of 6–8 hours is recommended. A factory for the annual production of 100 million lb. of polyose is under construction at Bombay.

2308. ***Bombax*-kapok.** *Meded. Inst. Trop. Amst.* No. 116 (*Afd. trop. Prod.* No. 45) 1956 (52–3, 72). 5 refs. [Du.e.]

A sample from China proved on analysis to be from *B. malabaricum*. Tabulated figures show the moisture, ash, and pentosan contents of 3 *Bombax* spp. and *Ceiba pentandra*. Pentosan content of kapok of *B. malabaricum* and *B. globosum* (from Surinam) is $< 25\%$. The latter is dark-brown, collected in the forest, and used only locally.

892.8. Heather. Broom etc. Osiers, Canes and Bamboos. Reeds and Rushes. Thatching Materials

See also Nos. 1646–9, 2259.

2309. BADHWAR, R. L., and KADAMBI, K. **Cheap housing forest materials of India (Bamboos and thatches)—methods of increasing their production.** *Indian For.* 82 (10), 1956 (524–7).

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

2310. **[The progress and problems of Southern forestry.]** *J. For.* 54 (10), 1956 (627–92).

A special issue including articles on: The South's forest resource (*P. R. Wheeler* and *J. W. Cruikshank*); the hardwood lumber industry (*G. C. Romeiser*); Southern Pine lumber (*V. W. Cothern*); forest products and the prosperity of the South (*H. J. Malsberger*); naval stores (*H. Langdale, Jr.*); specialty products from hardwood and Pine (*W. R. Smith*); the progress of protection from forest fires (*J. E. Mixon*); progress in forest entomology (*L. W. Orr* and *E. J. Kowal*); forestry disease research (*G. H. Hepting*); progress in professional education (*C. M. Kaufman*); and progress in forest and related research (*E. L. Demmon* and *P. A. Briegleb*).

2311. Informe sobre política forestal—El Salvador. **[Report on forest policy—El Salvador.]** [*Docum.*] *5th Sess. FAO Latin Amer. For. Comm., Caracas 1955* No. *FAO/LAFC*-55/9, 1955. pp. 2. [Span.] Limited distribution.

2312. Informe sobre política forestal—República de Cuba. **[Report on forest policy—Cuba.]** [*Docum.*] *5th Sess. FAO Latin Amer. For. Comm., Caracas 1955* No. *FAO/LAFC*-55/10, 1955. pp. 4. [Span.] Limited distribution.

2313. **Symposium on [agriculture and forestry in] the three Guianas organised by the Royal Tropical Institute, Amsterdam, in collaboration with the Surinam Planning Board.** *Meded Inst. Trop. Amst.* No. 112 (*Afd. trop. Prod.* No. 42) 1955. pp. 121. [E.e.] Price *Fl.*5.

Includes a report, with recommendations, by the Forestry section and the following papers: Forestry in British Guiana; The improvement of Guiana forest stands [mainly by planting tropical Pines] (*J. W. Gonggrijp*): Some ideas on the improvement of forest exploitation in the tropics (*J. F. Kools*); Forestry and wood research with regard to Surinam (*A. T. J. Bianchi*); Some forestry problems in French Guiana (*F. Merveilleux du Vignaux*).

2314. KEITH, H. G. **Report to the Government of the Philippines on forest policy and legislation.** *Expanded Technical Assistance Program, FAO Report* No. 470, 1956. pp. 95 + 33 photos. 45 refs.

902. History of Forests and Forestry

See also Nos. 1398–1401, 2018, 2318.

2315. GUINIER, P. Arbres et forêts du Massif central. (Notes botaniques et forestières). **[Trees and forests of the Massif Central—botanical and**

silvicultural notes.] *Bull. Soc. bot. France* 83 (Spec. No.), 1956 (95–114). 31 refs. [F.] O.B.D.

Discusses the history of the region, deforestation due to man, later reforestation, and the development of the forests of recent origin, with notes on the rôle in the present forests of three important species: *Pinus sylvestris*, with particular reference to the development of ecotypes, *Pinus mugo* var. *rostrata* and *Picea abies*.

2316. Banti, G. Un antico inventario forestale genovese. [**An ancient Genoese forest inventory.**] *Monti e Boschi* 7 (10), 1956 (458–68). 4 refs. [It.]

Gives the text (spelling modernized) and discusses an inventory of the territory of Montoggio (Genoa), made in 1564.

2317. Bourdo, E. A., Jr. **A review of the [U.S.] general land office survey and of its use in quantitative studies of former forests.** *Ecology* 37 (4), 1956 (754–68). 45 refs.

Discusses the data available from old surveys and the degree to which statistical analysis is applicable.

903. Forest Policy, General

See No. 2351.

904. General Regional Accounts of Forests and Forestry

See also Nos. 2369–71.

2318. Edlin, H. L. **Four Cornish forests.** *Emp. For. Rev.* 35 (4), 1956 (437–47).

Briefly describes the historical background of Cornish forestry and summarizes present-day developments, the chief of which is the conversion from Oak coppice to conifers. Four forests in the Bodmin district are discussed.

2319. 'Die grüne Steiermark'. [**Green Styria.**] *Allg. Forstztg.* 66 (17/18), 1955 (214–43). [G.]

Articles in this special number include: Forestry in Styria (*A. Elsässer*); Management questions in E. Styria (*O. Eckmüllner*) [stressing the need for a forestry fund or similar financial cushion to prevent fellings at wrong times in cases of death etc.]; War damage (*H. Arvay*); History of forest transport in Styria (*F. Hafner*) [chiefly on river driving]; Extension and education for Styrian farmers (*W. Purrer*); Forest grazing (*F. Schneiter*); hunting and shooting in Styria (*F. Meran*); and Fishing (*K. Stundl*).

2320. La forêt et le forestier au XX^{e} siècle. [**The forest and the forester in the 20th century.**] *Rivières et Forêts, Paris* Cahier spécial No. 1, 1956. pp. 104. [F.]

A special number, with many photographs, and including the following articles: The forest in nature and as a factor in the life of the world (*P. Guinier*); The forest as an element in a balanced rural economy (*J. de Vaissière*); Man and the forest (*R. Heim*); Trees and cities (*P. Randet*); Forests in relation to tourism and walking (*A. Rivé*); Forest production—the timber trade (*S. Proust*); History of the Administration des Eaux et Forêts; The modern forest service; Forest management techniques; Utilization of wood; Forestry education and research; Hunting and regeneration of the forest; Fishing and the Administration des Eaux et Forêts.

2321. Guinaudeau, J. Nord-ouest de l'Espagne: aperçu de quelques problèmes forestiers. [**Some forestry problems of N.W. Spain.**] *Rev. for. franç.* 8 (12), 1956 (813–25 + 6 photos). [F.]

Gives a short account of the forests and plantations of the region and more detailed notes on current research, grafting methods, provenance trials with *Pinus pinaster*, afforestation with Eucalypts and *P. radiata*, and effects of the severe frost of Feb. 1956.

2322. Nikitin, P. **Organisation and utilisation of forests in the Ukrainian SSR.** *Mimeographed Series, Research Program on the U.S.S.R., New York* No. 78, 1955, pp. 85. 10 refs.

Gives details, based on the author's experience and on the literature, on forest area, with physical and administrative classifications, and on economic evaluation; forest management and felling systems; annual increment and drain; classified forest products; protection engineering and maintenance work in the forests.

2323. Hvoslef, O. Skogene norden for polarcirkeln. [**The forests north of the Arctic circle [an account of a tour in Norway and Finland].**] *Tidsskr. Skoghr.* 64 (4), 1956 (185–207). [Nor.]

2324. [**The trees and forests of Yemen.**] *Unasylva* 10 (3), 1956 (150).

An account by the FAO Regional Forestry Officer, mentioning many species, of which a number of *Acacia* species, *Zizyphus spina-christi*, and *Cordia myxa* are the most important.

2325. **The Nigeria handbook.** The Crown Agents for Oversea Governments and Administrations, London. Reprinted 1956. pp. x + 339 + 6 maps. 17 pp. of refs. Price 15*s*.

Covers *inter alia* climate, geology, soils, and land tenure, and includes chapters by *D. R. Rosevear* on vegetation, forestry, and wild life. There are rainfall, temperature, geology, soil, vegetation and forestry maps.

2326. Reddy, C. U. K. **Puerto Rico and its forests.** *Indian For.* 82 (10), 1956 (501–10). 3 refs.

2327. Stein, A. H. **Natural forests of Chile.** *Unasylva* 10 (4), 1956 (154–60).

Notes on distribution, composition, and general condition.

2328. **The Kaingaroa State forest, New Zealand.** *Aust. Timb. J.* 22 (9), 1956 (985 . . . 996).

A general account of the largest man-made forest, covering climate and soils, history of planting, silviculture, protection, extraction etc. The planted area totals 260,000 acres, including (in thousands of acres): Radiata Pine 117, Ponderosa Pine 52, Douglas Fir 35 and Corsican Pine 30. [Cf. *F.A.* 18 No. 2159.]

905. Forest Statistics and Resources

2329. Wiebecke, C. Zum Stand der deutschen Forststatistik. [**The present state of German forestry**

statistics.] *Forstarchiv* 26 (1), 1955 (1–8). 63 refs. [G.]

Mentions briefly surveys made in Germany up to 1945 and in W. Germany after 1945, and gives data (mainly based on the land utilization survey of 1954) for general land area and population, forest area, number and size of forest enterprises and their ownership, number of workers employed in forestry, distribution of species, age-classes, growing stock, increment, annual cut and timber yields.

2330. L'activité forestière, les industries du bois et du liège dans le Sud-Ouest de la France: inventaire statistique au début de 1955. [**Forestry, the timber and cork industries in S.W. France: statistical survey at the beginning of 1955.**] *Chêne-Liège* 62 (1543), 1956 (17 . . . 23). [F.]

2331. Metsätilastokomitean mietintö. [**Report of the Committee on Forest Statistics.**] *Silva Fenn.* No. 89, 1956, pp. 126 [Fi.e.*e.*]

The Committee was appointed in 1951 to make proposals for improving the collection and analysis of forest statistics for Finland. The present report, in addition to making such proposals, gives the results of two pilot surveys, one on wage and employment statistics, the other (with separate English summary) on felling and roundwood price statistics. There is also a short English summary of the general proposals.

2332. Metsätilasto: kertomus metsähallinnon toiminnasta v 1954. [**Forest statistics: report on the activity of the [Finnish] State Board of Forestry in 1954.**] *Suomen Virallinen Tilasto* (*Ser. XVII*) No. 43, 1956. pp. 59. [Fi.Sw.e.]

2333. BÖCKENFÖRDE, A. Forst- und Holzwirtschaft im Nahen Osten. [**Forestry and wood in the Middle East.**] *Holz-Zbl.* 82 (58; 65/66; 88; 129; 133–136), 1956 (727; 815–16; 1099–1100; 1570; 1611–2; 1616; 1638–9; 1646). [G.]

A series of 8 articles on Cyprus, Turkey, Israel, Syria, Lebanon, Jordan and Egypt, with particular reference to their import requirements and sources of supply.

2334. **Wood and paper products: printing trades: operations in the woods: 1953.** Dominion Bureau of Statistics, Ottawa. 1956. pp. 291. [E.F.]

Brings together statistics on Canadian forestry and the wood-using industries from several of the Bureau's statistical publications.

2335. STODDARD, C. H. **Some statistical needs in forest economics.** *J. For.* 54 (12), 1956 (841–2).

Draws attention to the lack of data on rough forest products in the U.S.A. and what data need collecting, e.g. types of timber farms, their gross and net income, wages bills, volume and value of outturn.

2336. ZIVNUSKA, J. A. **Timber today and tomorrow: an independent appraisal of the Timber Resource Review (preliminary review draft).** Forest Industries Council, New York. 1956. pp. 75. [Cf. *For. Abstr.* 17 No. 3521.]

2337. CRUIKSHANK, J. W., and MCCORMACK, J. F. **The distribution and volume of Hickory lumber.** *Hickory Task Force Rep. Stheast. For. Exp. Sta.* No. 5, 1956. pp. 12. 6 refs.

Contains sketchmaps showing the botanical and commercially relevant distribution of *Carya ovata, C. laciniosa, C. glabra, C. tomentosa, C. illinoensis, C. aquatica, C. myristicaeformis* and *C. cordiformis*, with data on quantity and quality. Net volume of sawtimber is ca. 24,000 million bd. ft., mostly in mixed Oak/Hickory forests, and is increasing.

2338. STERNITZKE, H. S. **Timber supplies for industry in Arkansas.** *For. Resour. Rep. U.S. For. Serv.* No. 11, 1956. pp. 32.

2339. HUTCHISON, O. K. **Indiana's forest resources and industries.** *For. Resour. Rep. U.S. For. Serv.* No. 10, 1956. pp. 44. 8 refs.

2340. VASILEVSKY, A. M. **Commercial forest land in Minnesota counties by forest type.** *Tech. Note Lake St. For. Exp. Sta.* No. 470, 1956. pp. 2.

Gives data for each county on the total forest land, the areas occupied by different forest types and the % of non-stocked forest land. Aspen/Birch is the predominating type.

2341. GEDNEY, D. R. **Annual cut and timber products output in the Pacific Northwest in 1952.** *For. Surv. Rep. Pacif. Nthwest. For. Range Exp. Sta.* No. 126, 1956. pp. 29.

The results of a study of timber-harvesting operations in the forests of Oregon and Washington in 1952, with tabulated data on the annual cut by county and by species, the output of timber products and logging residue, consumption of raw material for timber products, timber products by species, and log production. Methods of procedure and the significance of findings are discussed.

2342. GEDNEY, D. R. **Public and private forest landownership in the Pacific Northwest shows stability.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 131, 1956. pp. 3.

Gives data based on Forest Survey inventories between 1933 and 1953, showing the amount of land in private, county, State and Federal ownership in the Douglas Fir and Ponderosa Pine subregions of Oregon and Washington.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116 and No. 1271.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also No. 1222.

2343. **The land of Scotland: a statement of policy [on land use].** Scottish Landowners' Federation. 1956. pp. 27 + 8 photos.

2344. SWINGLER, W. S. **Forestry in the Soil Bank.** *J. For.* 54 (11), 1956 (747–9).

Describes the aims, working details, and administration of the Acreage Reserve and Conservation Reserve programmes of the 1956 Agricultural Act, and their implications for forestry.

2345. WORRELL, A. C. **Optimum intensity of forest land use on a regional basis.** *For. Sci.* 2 (3), 1956 (199–240). 21 refs.

A solution of this problem is exemplified by a detailed study of a 10-county region of Georgia, containing 782,000 acres of Pine/hardwoods, $< 1\%$ of which is publicly owned.

2346. **Final Report of the Working Party on Afforestation and Reforestation, 5th Session, Nîmes 1956.** [*Docum.*] *5th Sess. FAO European For. Comm. Wkg. Party on Afforestation and Reforestation* No. *FAO/EFC/AF*/12, 1956. pp. 27.

Includes tabulated data on operations carried out (afforestation, new plantations outside the forest, forest improvement, reforestation and deforestation) by 20 European countries, Turkey and Israel.

2347. KEITH, H. G. **Report to the Government of Malta on the afforestation of waste lands and the development of tree planting on agricultural lands in the Maltese Islands.** *Expanded Technical Assistance Program, FAO Report* No. 551, 1956. pp. 32. 8 refs.

2348. KASAPLIGIL, B. **Report to the Government of the Hashemite Kingdom of the Jordan on an ecological survey of the vegetation in relation to forestry and grazing.** *Expanded Technical Assistance Program, FAO Report* No. 549, 1956. pp. 39 + 3 maps.

2349. FISHWICK, R. W. **Some problems confronting the introduction of grazing control in savanna forests of northern Nigeria.** *Arbor, Aberdeen* 2 (5), 1956 (25–8).

92. Forest Ownership and Ownership Policy

See also No. 2017.

2350. ASHBY, A. W. **Public lands: an FAO land tenure study.** *FAO agric. Stud.* No. 31, 1956. pp. 47. 29 refs.

Briefly examines the historical aspect of public land ownership, explains the various kinds of public ownership and re-examines several problems of public land policy. Particular attention is devoted to the alienation of public land, the management of public holdings and the rôle of public land in agricultural development.

2351. **A summary of briefs to the royal commission of forestry.** *B.C. Lumberm.* 40 (10; 11), 1956 (26 . . . 30; 32, 34).

Summaries of Crown Zellerbach Canada Ltd., Alaska Pine and Cellulose Ltd., Powell River Co. Ltd., the Western Forest Management Association and MacMillan and Bloedel Ltd., cover their submissions to the Sloan Commission on tenure, scaling, royalties, yield control, conditions of licence and type of licensee.

2352. OECHSLIN, M. Die Waldungen der Korporation Uri. **[The forests of Uri corporation.]** *Schweiz. Z. Forstw.* 107 (12), 1956 (745–62). [G.f.]

Describes the history, including old regulations, composition, administration and management (chiefly selection system) of these 13,000 ha. of communal mountain forest, the rights to fuel and timber, or cash commutations, of its 20,000 owners, development of growing stock, annual cut, forest roads, etc., with a discussion of the principles of mountain forestry, e.g. the need to protect the scrub forests of the upper alpine zone.

2353. WOBST, A. Die Bewirtschaftung der hessischen Gemeinschaftswaldungen im Zusammenhang mit der Bildung neuer forstlicher Zusammenschlüsse. **[The management of Hessian communal forests in connexion with the formation of new associations of forest owners.]** *Allg. Forst- u. Jagdztg.* 127 (5/6), 1956 (103–6). [G.]

Describes various named groupings, chiefly of small farmers holding forests in common ownership managed under state supervision, giving size of individual holdings, annual cut etc. Yields are less than in state forests, but better than in individual holdings of small owners, who should therefore be encouraged to combine.

2354. LINNAMIES, O. Yhtenäisten metsätalousyksikköjen pirtomisen vaikutuksista metsäsälouden. **[The effect of splitting up uniform forest holdings on forest management.]** *Metsät. Aikak.* 1956 (6), (143–7). [Fi.e.]

Discusses the disadvantages of working forest land in small parcels, the creation in Finland, since the war, of 30,000 forest holdings by splitting up large units, and the possibility of purchase by the Forest Service of new land to consolidate small holdings. *From author's summary.*

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

2355. SPEER, J. Die Forstrechte in der neuen Einheitsbewertung. **[The treatment of forest rights in the forthcoming revaluation of forests [in W. Germany].]** *Allg. Forst- u. Jagdztg.* 127 (4), 1956 (69–75). [G.e.]

Whereas pasture and litter rights reduce yields and are hence automatically reflected in the valuation, rights to wood are not. Nevertheless, present practice and the draft valuation bill ignore their effect. This is considered unfair and detrimental to forestry interests, as it tends to perpetuate these servitudes, which remain untaxed, and an amendment of the law is advocated. There are still $> 45{,}000$ rights exercised in Bavarian state forests alone.

2356. SCHWARZ, H. Das forstliche Bringungsrecht in Österreich. **[The law governing extraction and transport of forest produce in Austria.]** *Öst. Vjschr. Forstw.* 97 (1), 1956 (1–26). 4 refs. [G.]

Deals chiefly with the moving of timber across other people's land and the administrative requirements for cableways, floating installations, etc. The texts of the relevant sections of existing laws and regulations, and of the proposed new forestry law, are given in an appendix.

2357. **Czechoslovakia: Government decree on the organization of forestry economy, 20 Jan. 1956.** In *Food agric. Leg.* 5 (2), 1956. pp. 3.

2358. Novo código florestal. **[New forest law.]** *Brasil madeireiro* 11 (111–113), 1956 (25–8; 16–8; 14–6). [Port.]

Text of a projected new forest law.

2359. ANDERSON, L. F. **Air pollution and tree disposal.** *Shade Tree* 29 (8–10), 1956 (1–4; 4–5; 3–5).

Gives the relevant portions of the New Jersey Air Pollution Code and discusses their effect on the disposal of slash, brushwood etc., particularly with reference to municipal parks, street trees etc.

94. Other Methods to Implement Forest Policy

See also Nos. 2021–2.

2360. **Extension forestry practices in Canada.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1558(*F*-1), 1956. pp. 23.

A panel discussion on whether management services should be provided for private woodland owners and, if so, just what services, and whether by the industry, the state or the universities.

942. Credits

2361. Investitionskredite der Forst- und Holzwirtschaft. **[Investment credits in forestry and the wood industry.]** *Holz-Kurier, Wien* 11 (47), 1956. pp. 10. [G.]

Describes the various schemes for obtaining investment loans and (exceptionally) subsidies for purposes of afforestation, road-building and other improvements, purchase of equipment for sawmills, transport undertakings etc., out of ERP funds, and the administrative machinery, and gives some figures on loans and subsidies granted or available, their distribution between forestry and industry, etc., for Austria.

943. Forest Insurance

2362. PENDLEBURY, C. L. **Fire insurance for woodlands.** *J. Land Agents' Soc.* 55 (12), 1956 (472–4).

Notes on the terms of policies available and their repercussions on taxation, in Great Britain.

944. Co-operation. Collaboration of Forest Owners

2363. UPPIN, S. F. **Co-operation in forestry and forest labourers' co-operative societies in Bombay State.** *Indian For.* 82 (11), 1956 (577–82).

945.3. Education. Training. (Including Educational Tours)

2364. Eidgenössische Technische Hochschule 1855–1955. **[The Federal Technical College [Zurich], 1855–1955.]** Buchverlag der Neuen Zürcher Zeitung, Zürich. 1955. pp. xix + 723. [G. or F.]

A history and description of the college by members of the staffs of the various departments.

2365. CHAPMAN, V. J. **Is it time to re-establish university forestry school?** *N.Z. Timb. J.* 3 (3), 1956 (36–7).

A plea for the re-opening of a New Zealand forestry school which should give to B.Sc. entrants a postgraduate course of one, or a master's course of 2 years, with an explanation of University, Forestry Department, and Government attitudes to proposals already made.

2366. SERAPHIM, G. M. **The Cyprus forestry college.** *Arbor, Aberdeen* 2 (5), 1956 (29–32).

2367. WOHLFAHRTH, E. Erfahrungen bei der Ausbildung von Waldarbeitern. **[Experiences in the training of forest workers.]** *Schweiz. Z. Forstw.* 107 (10), 1956 (529–36). [G.f.]

Describes German methods, particularly those practised at the Fürstenberg forest estate, Baden-Württemberg, dealing with length and stages of practical training, attendance at forest workers' schools, and subjects taught. The stress is on practical instruction, tool maintenance etc., and the possession of a set of basic tools is a condition for passing the final examinations.

2368. KILCHENMANN, H. R. Erfahrungen bei der bisherigen Holzhauerausbildung. **[Experiences to date in the training of woodcutters.]** *Schweiz. Z. Forstw.* 107 (10), 1956 (536–44). [G.f.]

Describes the development, organization, finance and conduct of woodcutters' courses of 2 or 3 weeks in Switzerland, of which 10 to 15 are held annually at different places. The opportunity given to participants of buying modern tools at cheap prices, and the modern techniques taught, have contributed to a rise in efficiency and a reduction in the accident rate. Power-saw courses, and courses in skidding etc. have recently been held. Unfortunately, the number of courses and participation in them has always been less in the mountains than in the lowlands.

2369. **Forestry study tour [in Czechoslovakia]: silviculture of pure and mixed stands. Trip notes.** FAO, Rome. No. *FAO*/56/7/4934, 1956. pp. 73.

Notes on a number of excursions to different forests and on some specific research, e.g. on micro-edaphon, microbiology of healthy and sick soils, torrent damming, water balance, wind damage, and landslides.

2370. BLANCKMEISTER. Waldbau und Forsteinrichtung in der CSR. **[Silviculture and forest management in Czechoslovakia.]** *Forst u. Jagd* 4 (1), 1954 (3–5). [G.]

A report on a study tour, containing information on the forest research institute at Strnady near Prague, the forest management 'Institutes' (regional planning offices), the forest plant breeding institute at Kunowice and the research departments of the forestry school of Brno. Includes a brief description of an increment borer which takes cores of only 3 mm. diameter, avoiding injury to the tree, developed at Brno.

2371. PUZYR, H. Eine Studienreise nach Bosnien und Dalmatien. **[A study tour in Bosnia and Dalmatia.]** *Allg. Forstztg.* 66 (19/20), 1955 (262–6). [G.]

Includes short descriptions of the reserved virgin forest of Perucica (alt. 1100–1500 m.) stressing its appearance of even heights; Dalmatian maquis communities; vegetation zones; Karst afforestation, including windbreaks; and the rehabilitation of degraded scrub coppice for fuelwood production.

945.4. Research

See also Nos. 1220, 1729, 2037, 2044–6, 2321, 2364, 2369–70.

2372. **List of research workers 1956. Research workers in agriculture, animal health and forestry in the British Commonwealth, the Republic of Sudan and the Republic of Ireland.** Commonwealth Agricultural Bureaux, Farnham Royal, Bucks. 1956. pp. iii + 472. Price 42*s*.

2373. LAURIE, M. V. **Current trends in forest research in Britain.** *Emp. For. Rev.* 35 (4), 1956 (375–85).

Summarizes past work and discusses problems now being studied, of pathology, entomology, nursery techniques, mixture and thinning experiments, genetics and hybridization.

2374. MACDONALD, J. **Forest research in England and Wales.** *Quart. J. For.* 50 (4), 1956 (267–77).

A conference paper with discussion. Among the subjects touched on are genetics, survey of seed sources, tree breeding, effects of various degrees of thinning, afforestation of bare ground, and rehabilitation of derelict woodland.

2375. **[The Forest Research Institute of Turkey.]** *Unasylva* 10 (3), 1956 (147).

A short description of the Institute's experimental forests, Büyükdüz forest on the Black Sea, and Çamkoru forest near Kizilcahamam (Anatolia), experimental shelterbelt plantations near Balo, and experimental pastures near Bolu.

2376. OSBORNE, J. G. **Report on the Far Eastern research workers' seminar, Dehra Dun, India (12 October–10 December 1955).** *Expanded Technical Assistance Program, FAO Report* No. 504, 1956. pp. 27 + 1 photo.

The seminar was mainly concerned with lay-out and maintenance of experiments, and statistical analysis of data.

2377. **Forest research in India, 1950–51. Part II. Reports for Burma and Indian States.** Manager of Publications, Delhi. 1956. pp. 113. Price *Rs*.7·4 or 11*s*. 6*d*.

2378. LANDON, F. H., and SETTEN, G. G. K. **Forestry and forest research in the Federation of Malaya: a problem analysis.** *Res. Pamphl. For. Res. Inst. Kepong* No. 19, 1956. pp. 19. 20 refs.

A revised version of the problem analysis submitted to the FAO international seminar for forest research workers held at Dehra Dun in 1955.

2379. **Research programme: Progress Report 1955.** *Res. Pamphl. For. Res. Inst. Kepong* No. 15*B*, 1956. pp. 74.

Notes on current research projects of the Forest Department of Malaya and the Forest Research Institute, Kepong.

2380. PRASAD, J. **Report to the Government of Thailand on silvicultural research [with separate Annex].** *Expanded Technical Assistance Program, FAO Report* Nos. 532, 532*A*, 1956. pp. 70 + 6 drawings.

A general account of climatic etc. conditions, the problems needing elucidation, and recommended organization. The annex gives outlines of designs for research on 12 proposed projects.

2381. JACKSON, J. K., and PEAKE, F. G. G. **Forestry research in the Sudan 1950 to 1954.** *Mem. For. Div. Sudan* No. 7, 1955. pp. 63.

Much of the matter covered has already appeared in the annual reports of the department. Sections on irrigated and other plantations of the plains and of the montane forest area, gum arabic, entomology and utilization are included.

2382. **Seventh annual report on active forest research projects, year ended March 31, 1956.** Forestry Branch, Department of Northern Affairs and National Resources, Ottawa. 1956. pp. 146.

2383. **Economics research needs related to wildland management and development in the mountain states.** *Res. Pap. Intermt. For. Range Exp. Sta.* No. 38, 1956. pp. 27. 1 ref.

A survey, touching *inter alia*, on watershed management in Utah, timber requirements and main forest management objectives, and listing projects undertaken for stand improvement, regeneration by planting, and pruning.

2384. SCHORY, E. A., SR. **1954–55 Progress Report: Tropical Forestry Project.** [Florida Forest and Park Service, Talahassee, Fla.] 1955. pp. 18.

Research in progress [by the Florida Forest Service?] includes nursery practice, bare-root planting, shade species, and experimental plots of *Eucalyptus tereticornis*, *Albizzia* spp., *Dalbergia sissoo*, *Swietenia mahagoni*, *Khaya nyasica*, *Enterolobium excelsum*, *Callitris* spp., *Casuarina equisetifolia*, and *Melaleuca leucadendron*.

2385. El Centro Forestal Nacional—Sub-estación Experimental Agronómica de Montaña, Tope de Collantes. **[The National Forestry Centre—Experimental Substation in Mountain Agriculture, Tope de Collantes.]** *Rev. Agric., Habana* 39 (2), 1956 (97–112). [Span.] E.M.B.

The Centro Nacional in Cuba began in 1939 as a small agricultural experiment station and was later given the status of the National Forestry Centre. Extensive work has been done in trials of species for afforestation and the distribution of plants and seeds. Species distributed during the life of the centre are listed.

95. Forest Taxation

2386. **Income tax and estate duty on woodlands.** *Leafl. For. Comm., Lond.* No. 12 (rev.) 1956. pp. 9. Price 9*d*.

Sets out the basis on which an assessment to income tax upon an owner of woodland is made, and his liability to estate duty.

2387. VINEY, R. La nouvelle taxe sur les successions et donations et la forêt. **[The new tax on inheritance and deeds of gift in relation to the forest.]** *Rev. for. franç.* 8 (10), 1956 (676–9). [F.]

Discusses the probable effects on forestry of a French decree of 6 July 1956, instituting a tax on inheritance and deeds of gift ranging from 1% on amounts $\leqslant$ 2 million francs to 5% on amounts of $\geqslant$ 5 million.

2388. SELLÆG, H. De nye forskrifter for taksering og verdsettelse av skog. **[The new instructions for making surveys and evaluation of forests.]** *Norsk Skogbr.* 2 (20), 1956 (647 . . . 655). [Nor.]

Discusses the new instructions adopted by the State Taxation Board, replacing those of 1931 and to come into effect in 1957–58.

2389. SEIP, H. K.; SÆTHER, R. Formuesbeskatningen av skog. **[Assessment of forests for property tax.]** *Norsk Skogbr.* 2 (21), 1956 (699–701). [Nor.]

Further discussion of the new instructions of the State Taxation Board.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See also No. 2363.

2390. WETZEL, E. Die Löhne der Waldarbeiter in Baden-Württemberg. **[The wages of forest workers in Baden-Württemberg.]** *Forst- u. Holzw.* 12 (1), 1957 (7–8). [G.]

Tables show mean hourly earnings on time and piece rates, average times worked during the year, and mean annual earnings for various grades and types of worker, separately for state and communal enterprises. Nearly all piece-rate earnings are higher than time rates, and the differences between men's and women's earnings are great.

2391. NONOMURA, Y. **[A study on forest workers' unions.]** *For.* [*industr.*] *Econ., Tokyo* 9 (8), 1956 (2–10). 9 refs. [Jap.]

Discusses the economic conditions favouring the creation of local unions, the terms and conditions under which such unions supply labour to the employer (e.g. on contract), and how they control it, and mutual aid activities (e.g. insurance) within the unions.

97. International Forest Policy and Other International Collaboration

2392. KISHEN, J. **International action in forestry.** *Indian For.* 82 (11), 1956 (562–8).

Briefly describes past and present organizations for co-operation in research, conferences etc.

971. Congresses, Conferences

See also Nos. 1312, 1397, 2313, 2376.

2393. **Proceedings of the international conference on the peaceful uses of atomic energy, held in Geneva 1955. Vol. 12. Radioactive isotopes and ionizing radiations in agriculture, physiology and biochemistry.** United Nations, New York. 1956. pp. ix + 553. Many refs. Price £3 3*s*. L.S.

Contains 94 papers, of which nearly half deal with some aspect of plant breeding, plant physiology and biochemistry, soil relations, or pests.

972. Organizations

2394. **Inter-African scientific and technical co-operation. 1948–1955.** Commission for Technical Co-operation in Africa South of the Sahara, London. [1956]. pp. 294.

Contains the articles of agreement for the establishment of the Commission and its constitution, and an account of its conferences and resolutions and implementation by member governments. Some of the work is of direct, and much is of indirect interest to forestry. Among the former is an account of the Abidjan forestry conference 1951 with resolutions on 15 items.

FORESTRY THE WORLD OVER

References: 1. *FAO press release*, Rome; 2. *Forest Farmer*, Atlanta, Ga.; 3. *Forêt*, Neuchatel; 4. *Holz-Kurier*, Vienna; 5. *Italia Agricola*, Rome; 6. *Journal of Forestry*, Washington; 7. *Luma*, Concepción, Chile; 8. *Monthly Bulletin of the Iranian Forest Service*, Teheran; 9. *New Zealand Timber Journal*, Wellington; 10. *Southern Lumberman*, Nashville, Tenn.; 11. *Timber Trades Journal*, London; 12. *Times*, London; 13. *Unasylva*, Rome.

FAO. Plans are in hand to set up an FAO coordinating centre at Addis Ababa, Ethiopia, for operations against the desert locust. The new centre would be in addition to the existing one at Jeddah, which coordinates the international campaign in the Arabian Peninsula. The new centre would coordinate control operations in parts of the Sudan, Ethiopia, French Somaliland, the Somaliland Protectorate, Somalia and Kenya (**1**; 19.11.56).

A feature of the International Consultation on Fibre and Particle Boards held at Geneva, 21 Jan.–7 Feb. 1957, was the organization of an exhibition to show the latest developments of these industries. Some 600 specimens of boards and raw materials were contributed by commercial undertakings and technical institutes. The display also included several small-scale models of plants, and more than 100 photographs and charts to illustrate different types of equipment and processes of manufacture. The exhibition is the first of its kind to be organized at a technical meeting (**1**; Feb. 1957).

Australia. The C.S.I.R.O. is to investigate the possibility of making rain to douse bush fires. Australia Paper Manufacturers, Ltd., which has 17,000 acres of Pine, and extensive Eucalypt plantations near Sale in Eastern Victoria, has asked C.S.I.R.O. to make an aerial survey of local cloud formations, air currents, and other factors governing rainfall. An aircraft with the necessary equipment is expected to be used for more than a week (**12**; 7.2.57).

Canada. Development on a large scale of timber, mineral, and hydro-electric resources in northern British Columbia has been announced by the provincial government. An agreement has been signed with the Axel-Wenner-Gren interests of Stockholm. Capital investment up to 1000 million dollars will cover an electric monorail line to the northern boundary of British Columbia and development of forest resources on a sustained-yield basis. Surveys are to begin at once for railway location, minerals and forest inventories. Railway construction is expected to begin in 1960 (**11**; 23.2.57).

Chile. An association for forest research, founded at Concepción in 1955, under the name 'Luma', has now published the first issue of its review 'Luma'. Its aims are to promote research and disseminate its results, and to introduce standardization and cooperation in both public and private forestry enterprises (**7**; 1957).

Dominican Republic. There is a law in the Dominican Republic prescribing that all lumber shall be seasoned artificially. The Government has built 7 large kilns at strategic points. In La Costanza, for instance, 16 sawmills send their green lumber to the kiln. Each sawmill has its own small planer mill beside the kiln, where most of the lumber is planed. The dried and planed lumber then goes direct to the consumer by road, thus saving considerably on transport costs. The kiln at La Costanza has a capacity of 200,000 bd. ft./shift (6 stoves with 2 chambers each) and in 1955 dealt with 8½ million bd. ft. The price for seasoning is 15 pesos/1000 bd. ft. for small quantities, and 12 pesos for large, which corresponds to about 10% of the selling price. The Government built the kilns and has fixed the prices for seasoning, but the kilns are operated as private enterprises (**13**; March 1957).

Great Britain. Each of the 28 London boroughs is to be presented this year with a tree by the Metropolitan Public Gardens Association to commemorate the seventy-fifth anniversary of the founding of the association. The intention is that the trees shall be unusual and impressive, inviting an inquiring glance from the passer-by, rather than merely ordinary trees that everyone knows beforehand will flourish to a luxuriant metropolitan growth. The gift is not without its experimental aspect. The Association have in mind such trees as the Southern Beech, the Maidenhair or Gingko, the Pagoda tree that is round and spreading and has white pea-like flowers in September, the Dove or Ghost tree that also bears large white flowers and has a leaf not unlike the lime, and *Metasequoia glyptostroboides*. It is hoped that borough councils which accept the proffered gifts will mark them with a commemorative plaque and with the name of the trees (**12**; 5.3.57).

Carried away by the spectacle of the Third Division Bournemouth and Boscombe hustling First Division Tottenham Hotspur out of the Football Association Cup competition, a sports reporter referred to the defence of the latter team becoming 'as brittle as plywood against the shattering Bournemouth raids'. The T.D.A. in protest against this aspersion have sent a 4 × 3 ft. sheet of plywood inviting Bournemouth forwards to break it with shots from the penalty spot (**11**; 2.3.57).

New Zealand. Several years ago an American wood collector, using wood as mounts for small specimens of fluorescent rock, observed that some of his mounts glowed under the ultra-violet light. Hearing of this, a New Zealand member of the International Wood Collectors' Society, who has a collection of more than 1000 different wood specimens, tested each of his specimens under an ultra-violet lamp and found that some responded. In a recent exhibition at Wellington he displayed some of these (Sumacs, Acacias, Poison Ivy, Australia Beefwood, Ebony, Wattle, and Ash [? Eucalypt]) in a black-lined cabinet with an ultra-violet lamp. There appears to be no systematic pattern in the occurrence of this character, and the reason why some timbers should glow is unknown (**9**; Jan. 1957).

Persia. Plans to found a graduate School of Forestry and Pastures at Teheran envisage: (1) A 24- to 27-months course without vacations (except for public holidays); (2) two classes or 'years' of 30 students each; (3) candidates to be under 30 years of age on entry and to have a certificate of 6 years' study of mathematics or the physical sciences. Steps have already been taken to procure instructors for the school; one is a foreigner. There will be a minimum of five instructors to start with (**8**; Aug./Oct. 1955).

A Brigadier from the army has taken charge of the forest administration, and armed military detachments will in future help to enforce forest law (**8**; Dec./Jan. 1955/56).

A 6-months' training course for armed guards has been arranged (**8**; April/May 1956).

An FAO officer of an ETAP mission observes that in the bas-reliefs on the walls of Persepolis, representing the triumphs of Darius, the various groups are separated by a tree, which is always the same tree, and which he identifies as young specimens of *Pinus eldarica*. The trunk is covered by the characteristic scaly bark, the branches are covered with leaves, and the ends are bent up in the air like candles; the well developed terminal buds are visible. Finally, the cones, which are sessile, growing near the ends of the uppermost branches, and always leaning towards the end of the branch, are unmistakable. It is suggested that, since it is always young trees that are represented, Darius may have introduced them into Persia (**13**; March 1957).

Sweden. It is estimated that log production in Central and Southern Sweden will be reduced by 15–20% during the current year, owing to the mildness of the winter. Many secondary roads in Sweden are founded on clay and broken rock, surfaced with crushed rock. The strength of the road depends upon sun-baking in summer and freezing in winter. Heavy rain and mild weather have brought the clay to the surface, and many roads have been closed as unusable (**11**; 23.2.57).

Switzerland. Large flocks of crossbills have done great damage to the Spruce cone crop of the Jura, and in many places have practically destroyed the expected heavy seed crop (**3**; Jan. 1957).

U.S.A. East Texas has almost one million acres more forest land than in 1935 because so much land that had been cleared has reverted to forest. Forests cover 11,655,800 acres of the total land area of 19,038,700 acres in the commercial timber belt of E. Texas. The volume of all merchantable trees totals 7000 million cu. ft.; fire, insects and disease kill ca. 50 million cu. ft. of timber annually (**6**; Dec. 1956).

Pulverized bark from Southern Pines, impregnated with chemical nutrients, has been successfully tested as a soil improver-cum-fertilizer in nurseries and also on tobacco and other crops, particularly of acidophile plants. The nutrients are released slowly over a period of time (**10**; 15.11.56).

In the Piedmont of Georgia, wood shavings are used as litter in chicken houses. In 1954 ca. 120 million broiling fowls were raised, which created a demand for 50,000 truckloads of shavings, corresponding to 130 million bd. ft. of surfaced timber. Wood shavings are preferred to peanut hulls or sugar-cane residue because of their superior properties and their cheapness (**2**; Dec. 1956).

An experiment carried out jointly by Rutgers University and the Allied Chemical and Dye Corporation has shown the feasibility of fertilizing plantations from the air. The experiment was made at Deemerville, New Jersey, on a 28-year-old plantation of *Pinus resinosa*, the growth of which was very poor on account of the nutrient deficiency of the soil. A balanced N/P/K fertilizer in liquid form was applied from the air, resulting in an increase of 40–65% in increment. [Cf. *F.A.* 15 p. 541] (**5**; Dec. 1956).

Successful control of a brush fire in California was recently obtained by spraying it with borax and water from aircraft equipped for insect control. Seven aircraft, with 10-gallon tanks and spray equipment, were used in the operation (**4**; 28.2.57).

With a view to using up surpluses, a wallboard made from puffed wheat bonded with resin has been developed. It can be proofed against termites and rodents, and faced with metal, wood, or plastics, and may become a serious cheap competitor to plywood and fibreboard (**10**; 1.2.57).